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Internal Memo⁻

From: Phone: Waste Management Advanced Engineering Section

3-3985 2750E/A226/200E R2-11

Date:

April 5, 1989

Subject:

COST/SCHEDULE ESTIMATES FROM FLUOR DANIELS, INC.

To:

D. E. McKenney

R2-11

cc: RPA File/LB

Attached please find a brief report summarizing the cost/schedule estimates obtained from Fluor Daniels, Inc. (Fluor) on the pretreatment facility alternatives to B Plant. The summary describes a historical sequence of requests made by Westinghouse Hanford Company along with total estimated costs for the pretreatment facilities. Four reports were received from Fluor, which are appended to the summary as attachments. The four reports represented the total package received from Fluor on the cost/schedule estimate contract.

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Attachment

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COST/SCHEDULE ESTIMATES FROM FLUOR DANIELS INC.

Westinghouse Hanford Company (WHC) had requested Fluor Daniels Inc. (Fluor) to prepare cost/schedule estimates for pretreatment alternatives to B-Plant. Initially three alternatives were selected and they are the following: A new stand-alone facility, an expanded Hanford Waste Vitrification Project (HWVP) facility, and a facility colocated with HWVP. The total square footage of the stand-alone facility is 175, 000 ft² with two 42, 000 gallon dissolvers and the associated cesium removal and TRUEX process equipment. Fluor reviewed the layout drawings and recommended that the facility layout be modified on the basis of Fluor's experience with HWVP facility design. The modifications included such items as additional contact and remote maintenance and laydown areas, addition of a chiller room for the heating, ventilation and air conditioning (HVAC), expanded HVAC equipment rooms, addition of an off-gas system, and expansion of the cold chemical storage area. The Fluor modifications increased the area of the new stand-alone facility from 175, 000 ft² to 212, 000 ft². The same general modifications were also incorporated into the expanded HWVP and colocated facilities layouts.

Fluor performed total estimated cost and life cycle cost analysis for all three facilities after incorporating the modifications. The cost analysis did not include decontamination and decommissioning costs. Expense funded costs such as conceptual design, research and development, and pilot plant development were not estimated. The costs were calculated in terms of mid FY1988 dollars and escalated to the mid point of construction. The total estimated (capital) costs included detailed design, field engineering and inspection, direct construction, engineering management, construction management and project management costs. For these estimates, it has been assumed that a more significant technical demonstration and documentation step would be required in parallel with the validation step. Finally, feed supply/return lines were not included in the cost estimates.

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The total estimated costs are \$787M, \$745M and \$830M for the stand-alone, the colocated and the expanded HWVP facilities respectively. The cost of the colocated facility is the least and is about 5% less than that for the stand-alone facility. The total life cycle costs, which include the operation and maintenance costs are \$254M, \$245M and \$322M respectively for the stand-alone, the colocated and the expanded HWVP facilities. The life cycle cost analyses have been performed in accordance with the methodology provided in subpart A of 10 CFR part 436 and in NBS Handbook 135 (Rev.), "Life Cycle Costing Manual for the Federal Energy Management Program." The total estimated costs and the total life cycle costs for the three facilities, and the cost bases are described in the Fluor report entitled "Cost Studies - Process and Facility Options for Pretreatment of Hanford Tank Wastes," given as attachment 1.

The schedules for the construction of the three facilities are given in attachment 1. The stand-alone and colocated facilities schedules indicate that the new facility will not be operational until 4/1/2004, while the analysis indicates that the expanded HWVP facility could be brought on line by 7/1/2003.

Westinghouse Hanford Company subsequently requested Fluor to use the cost/schedule analysis for the 212, 000 ft² new stand-alone facility as a basis and perform cost/schedule estimates for a new stand-alone facility as originally proposed by WHC (Total Area = 175, 000 ft²). This was primarily done for 2 reasons. Firstly, the WHC process engineering personnel shared the opinion that even with a slightly

smaller-sized facility the pretreatment operations can be performed satisfactorily and efficiently. Secondly, the Fluor estimate was requested to compare with the cost estimate performed by Kaiser Engineers Hanford Company (KEH) for the 175, 000 ft² facility in order to add more credibility to the final reported figures. All costs were estimated in FY88 dollars and escalated by 4.35% to FY89 to achieve compatibility with the KEH estimate for the facility. The escalation was performed using the escalation table provided by KEH. The schedule utilized for escalation was the same schedule reported in attachment 1 for the 212, 000 ft² new stand-alone pretreatment facility. Unlike the 212, 000 ft² facility, life cycle cost analysis has not been performed. The total estimated cost and its basis are discussed in detail in attachment 2. The total estimated cost of the 175, 000 ft² new stand-alone facility is \$668M compared with \$564M for the KEH estimate.

Westinghouse Hanford Company also requested Fluor to determine the total estimated cost of a colocated facility similar to the 175, 000 ft² new stand-alone facility for comparison. The total estimated cost of a colocated facility of design similar to the 175, 000 ft² stand-alone facility is \$637M. The details of the total estimated cost, and the construction cost estimate summary and basis are given in attachment 3.

Finally, WHC requested Fluor to give total estimated cost of a 132, 000 ft² new stand-alone facility. This was the facility for which KEH previously provided the total estimated cost to WHC (1). Some slight modifications were made to the facility layout, and both Fluor and KEH were asked to provide estimates of total project cost for the facility. Here again, the two independent estimates were sought for comparison purposes and also to add more credibility to the final reported figures. In addition, the smaller facility was selected (with 21, 000 gallon dissolvers) so that the costs can be compared to the cost of modifying the B-Plant to include similar pretreatment processing capabilities. The total estimated cost from Fluor for the facility is \$591M as compared with the KEH estimate of \$440M. The total estimated cost, and the construction cost summary and basis are detailed in attachment 4.

Two very important conclusions can be drawn from the Fluor study. First and foremost is the fact that the cost of a colocated facility of a comparable design is the lowest. Secondly, regardless of the size of the facility, the schedule for completion of construction of any type of facility is approximately the same.

REFERENCES

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1. M. J. Kupfer, A. L. Boldt and J. L. Buelt, "Process and Facility Options for Pretreatment of Hanford Tank Wastes," SD-WM-TA-015, Draft, September 1988.

ATTACHMENT 1

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COST STUDIES

Process and Facility Options for Pre-Treatment
of Hanford Tank Wastes

February 1989

Fluor Daniel Inc. Advanced Technology Division Irvine, California



PRE-TREATMENT FOR HWVP

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Figure 4-2 Pre-Treatment Plant Schedule - Integrated (Expanded Vitrification Building)

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References

M. J. Kupfer, Al Boldt, J. L. Buelt (PNL), September 1988.
 "Process and Facility Options for Pretreatment of Hanford Tank Wastes", Westinghouse Hanford Company Richland, Washington, SD-WM-TA-015

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1.0 Introduction

Fluor Daniel was requested by WHC to provide a cost estimate on a Total Estimated Cost (TEC) level for two pre-treatment plant alternatives. Fluor Daniel elected to evaluate a third concept at no cost to WHC or DOE. The cost estimate was conducted during a three week time period and estimated three pre-treatment alternatives as follows:

- 1) Stand-Alone Pre-treatment Facility
- 2) Integrated Pre-treatment Facility (integrated within the HWVP Vitrification Building)
- 3) Co-located Pre-treatment Facility (co-located within the HWVP Plot Boundaries) (Fluor Alternative)

The cost estimate includes an estimate of life cycle costs for each pre-treatment alternative, as discussed in Section 5.0.

Section 6.0 provides a summary of areas for further study and why these areas are important in the development and implementation of a Pre-treatment Facility.

2.0 Purpose

The purpose of this request is to evaluate three alternative pre-treatment facility locations and to document the physical and financial parameters of each location. In addition, areas requiring additional study are to be identified.

Table 2-1 provides a summary of the three pre-treatment alternatives. Included in Table 2-1 is an overview of the CDG. DOC 1

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major facility areas and the deviations from the WHC supplied data. Also included in Table 2-1 is a summary of the TEC cost, life cycle cost, and key schedule dates for each pre-treatment alternative. Additional detail is provided in Sections 3.0, 4.0 and 5.0 of this report.

3.0 <u>Description of Alternatives</u>

A table (Table 2-1) comparing the Stand Alone, Co-located and Integrated Pretreatment facilities is included in Section 2 of this report.

3.1 Process Design Criteria

3.1.1 Introduction

The Waste Pre-treatment Facility could potentially process up to five major types of waste currently in storage at the Hanford 200 areas. Each waste type requires different pre-treatment methods with various alternatives. Reference 1 describes the various waste and waste treatment methods.

For purposes of estimating a pre-treatment option was selected for each waste type. This selection formed the basis for process equipment requirements and chemical usage.

The selected option for each waste type are discussed below.

3.1.2 NCAW (Neutralized Current Acid Waste)

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The neutralized current acid waste contains high concentrations of Sr-90. No equipment has been provided for the Sr-90 removal.

NCAW will be washed to remove soluble salts prior to feed into the pre-treatment facility. The washed sludge will be sent to the HWVP for vitrification. NCAW supernatant and sludge water will be processed through the pre-treatment facility to remove Cs-137 by ion exchange. The removed Cs-137 will be combined with other pre-treatment plant sludges and eventually vitrified in the HWVP.

Sludge washing could be accomplished in the pre-treatment plant or in a tank farm DST. The selected alternative considers the prior therefore not affecting the pre-treatment equipment or chemical usage. Figure A-1 (ref 1) is a block flow diagram of the selected process.

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3.1.3 PFP (Plutonium Finishing Plant Waste)

The Plutonium Finishing Plant wastes have relatively low concentrations of fission products. The PFP sludge is washed to remove soluble salts which are sent to the Grout Treatment Facility. The washed sludge is dissolved in HNO3 and processed through the TRUEX process, within the pre-treatment facility, to separate the transuranic (TRU) elements from the bulk of the inert salts, particularly chromium.

The removed TRU is combined with the solids remaining after the dissolution step for eventual vitrification in the HWVP. Figure A-4 (Ref 1) is a block flow diagram of the selected process and Figure A-11 (ref 1) contains a preliminary material balance.

3.1.4 NCRW (Neutralized Cladding Removal Wastes)

The neutralized cladding removal wastes, similar to PFP wastes, have relatively low concentrations of fission products.

NCRW wastes are pre-treated in a manner similar to PFP wastes. As a result of the high fluoride content of this waste, the nitric acid concentration used to dissolve the sludge is less than that used for PFP wastes.



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The NCRW supernatant and sludge washes are sent to the Grout Treatment Facility. The TRUEX process is used to remove the transuranic (TRU) elements from the bulk of the inert salts, notably fluoride and zirconium. The TRU fraction is combined with the undissolved sludge for eventual vitrification in the HWVP. Figure A-6 (ref 1) is a block flow diagram of the selected process and Figure A-12 contains a preliminary material balance.

3.1.5 CC (Complexant Concentrate Waste)

Both the complexant concentrate supernatant and sludge contain various organic complexants. It is assumed that these complexants must be destroyed before either TRUEX processing a routing the treated CC to the Grout Facility.

A slurry of CC supernatant and sludge is treated with hydrogen peroxide to destroy the organic complexants. The sludge is dissolved by use of a nitric acid solution which will acidify the supernatant and then it is processed through the TRUEX system.

Undissolved sludge is combined with the TRUEX TRU product for eventual vitrification in the HWVP. The raffinate is neutralized for routing to the Grout Facility.



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Figure A-9 (ref 1) shows the basic block flow diagram but the complexant destruction step is done prior to nitric acid addition.

Figure A-13 (ref 1) contains a preliminary material balance with the exception of the hydrogen peroxide addition.

3.1.6 SST (Single Shell Tank Waste)

The single shell tank wastes consist of a sludge layer covered by a salt cake. Wastes in the SSTs comes from several sources and is likely to vary substantially in composition from tank to tank.

The remaining fission product concentrations in the SST is relatively low. The transuranic (TRU) concentration in only half of the 149 single shell tanks exceeds 100 nCi/g.

It is assumed that only 75 single shell tanks with TRU concentrations in excess of 100 nCi/g are pre-treated. The retrieved SST contents are washed to remove the bulk of the soluble salts which are sent to the Grout Facility. The bulk of the washed sludge is dissolved in a two step process utilizing nitric acid and oxalic acid. TRUEX is used to remove the TRU components from the dissolved sludge as well as the relatively high concentrations of uranium. The uranium is



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combined with the TRUEX raffinate, neutralized and sent to the Grout Facility.

Recovered TRU is combined with the undissolved sludge and vitrified in the HWVP. A process block flow diagram is shown in Figure A-10 (ref 1) and Figure A-14 (ref 1) contains a preliminary material balance.

3.1.7 Process Design Impact to In-Cell Equipment

Several in-cell equipment items were added to the equipment list and layout drawings provided by WHC.

In comparing the Pre-treatment Flow Diagram ES-800-00 with the equipment list and the Facility Plan ES-800-02, three items appeared on the Flow Diagram but not on the equipment list or layout. The Precoat Storage Tank and the two PHP Filters were omitted. The filters are assumed to be mounted over the Sludge Receiver Tanks but additional cell floor space was needed for the Precoat Storage Tank.

In a visit to WHC, Fluor personnel were advised to add an ammonia scrubber system to the in-cell equipment. This system includes a 6 ft D x 12 ft H ammonia scrubber column, a 4000 gallon scrubber solution receiver, a 20 GPM concentration and a 4000 gallon concentrator condensate receiver. Fluor also



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added a 1000 gallon concentrator bottom receiver. These items added to the required cell space.

In discussions with WHC personnel, it was determined that the space allocated for the 21 remotely maintained centrifugal contactors was not sufficient. Additional space was allocated in the cell for these assemblies. The attendees at the above mentioned meeting were, Mike Kupfer, John Garfield, Al Boldt and, Dave Place from WHC. The Fluor representatives were B. J. Reckman and Rich Keenan. The interpretation of these requirements is indicated on the marked-up flow diagram in Appendix E.

3.2 Stand Alone Pre-treatment System

3.2.1 General Description

The salient features of the Stand Alone Facility are described as follows.

A table (Table 2-1) comparing the Stand-Alone, Co-Located and Integrated Pre-treatment facilities is included in Section 2 of this report.



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- 1) The facilities are located within the 200 E Area of the Hanford Site, as an all new Stand Alone Facility, complete with all HVAC Systems, utilities, electric power, emergency generator, additive, sampling, laboratories, maintenance, central control and office facilities.
- The Pre-treatment Flow Diagram (figure E) of SD-WM-TA-015 has been modified to include additional feed and storage tanks for additives, plus necessary utilities and additional modifications listed in table 2-1.

3.2.2 Cell Arrangement

The in-cell canyon arrangement reflects the full in-cell equipment list as modified by Fluor (Appendix A).

3.2.3 Canyon Size

Embedded nozzles and jumpers require a minimum of 5'-0" on each side of the 15'-0" diameter vessels to the wall. This requires a minimum cell width of 25'-0". Cell length is set by spacing of in-cell equipment 3'-0" apart; this results in an overall cell length of approximately 310'-0". The spacing appears adequate for approximately 600

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embedded nozzles (including 20% spares) to be located at the gallery walls. Pipe trench and closed loop utility jumper embeds are less congested.

Cover blocks are 40'-0" above the cell floor, to underside, which is sufficient to handle the largest stack up of equipment (25'-0"H) and jumpers. Cover blocks are assumed to be 3'-0" thick as at HWVP. Shield wall thickness is assumed to be 5'-0".

Shield windows or manipulators are not required for the chemical cell walls.

Lighting and all handling is via the canyon crane.

All canyon cell walls and floors are stainless steel lined to the bottom of the cover blocks.

3.2.4 Canyon Crane

A single 30 ton capacity 75'-0" span canyon crane equipped with lighting and CCTV will service all remote cells and the railroad well. Crane rails must be a minimum of 32'-0" above the cover blocks for the maximum length component to clear. The distance above the crane to the underside of the roof is 12'-0".



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A crane maintenance area (CMA) is provided for a 20'-0" wide crane bridge. Depth comparable to HWVP CMA is assumed.

A rising shield door is assumed (vs HWVP hoist system).

3.2.5 Master Slave Manipulator Repair

A single elevation metal building is required for MSM repair (6000 sq ft) and is located

adjacent to the Analytical Laboratory at grade. The equipment and configuration will generally conform to the HWVP approach. Space requirements are factored from HWVP based on the ratio of installed MSMs in the two facilities. One Decon glove box is required. Other equipment, e.g., monorails & tables, are replicated from HWVP. An airlock is required at each of two entry/egress points.

3.2.6 Regulated Maintenance Shops

Ample space has been allocated in the facility lower level corridor for regulated maintenance shops. Equipment costs are assumed equivalent to those used on the HWVP.



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3.2.7 Non-regulated Maintenance Shop

An external single elevation metal building is required for non-regulated maintenance activities. Space (5625 sq ft) and equipment equivalent to HWVP have been allowed. Access to non-regulated maintenance is from outside the controlled areas.

3.2.8 Failed Equipment Handling.

To allow prompt exchange of failed and replacement in-cell components by the canyon crane, it is necessary to provide remote and contact maintenance space. To assure this capability, a laydown area separate from the decon and repair cells is also required. This area, as a minimum, is sized to accept a dissolver, the largest single component. An area 30'-0" x 25'-0" has been provided.

A significant fraction of the failed equipment will not be repairable remotely nor decontaminable to contact levels, therefore, a Hanford standard burial box will be utilized for disposal. A remote cell is required for remote decontamination/maintenance of failed equipment and for size reduction (cut up) of equipment to be disposed of. A Failed Equipment Cut-Up Area 26'-0" x 39'-0" has been provided for this purpose. The cell is fully lined with stainless steel. Four shield window stations with master slave



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manipulators at the corridor wall, remote lighting fixtures, CCTV, utility service and decon solution supplies and two Electro-mechanical manipulators to operate the in-cell equipment are provided. For purposes of the cost estimate, the Failed Equipment Cut-up Area (FECA) equipment was assumed to be comparable to the Process Facility Modification Project FECA equipment.

Decontamination requirements to allow manned access into the failed equipment cut-up cell, would involve lengthy procedures, making it impractical. Also, loading of the disposal box, given the limited space and high contamination in this cell, is impractical. A separate, lower contamination, manned access cell (25'-0" X 39'-0") for contact maintenance and disposal box loading is provided. This cell will be capable of remote box handling and closure. It is equipped with two shield window stations each with two Master Slave Manipulators. One EMM will also be required as well as a hoist system for component handling. The cell is fully stainless steel lined and equipped with utility supply and decon solution services.

The above approach is consistent with HWVP plans.

3.2.9 Sampling and Analytical Laboratory



Samples will be drawn in shielded cells adjacent to the canyon cells and the corresponding in-cell equipment. Four cells (two for each process cell) will be required. Combined with these cells will be remote analytical cells. Design will be comparable to the HWVP concept. A total of 35 sample assemblies are provided, spaced at 1'-4" centers. Three sample caves will collect seven samples each. This requires 10'-0" of inside length. An additional 10'-0" is required for analytical work for a total inside length of 20'-0". The fourth cave will collect 14 samples and have two analytical cells for a total inside length of 40'-0". A single service room is provided between each set of sample/analytical caves in the two corridors to operate the transfer drawers servicing these cells.

Shielding is assumed to be 28" of high density concrete on three sides. Equipment includes 10 - 28" deep shield windows, 20 MSM's and 35 liquid sample modules. In-cell equipment is comparable to HWVP except that four transfer drawers are required.

The hot laboratory will be a single level metal building (3780 sq ft) located adjacent to the main structure. Equipment requirements and costs are assumed to be the same as for the HWVP analytical laboratory.

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A cold laboratory is required for analysis of incoming cold chemicals via rail or truck. This facility is assumed to be identical in size and cost to the HWVP concept.

3.2.10 HVAC Systems

The stand-alone facility is serviced by the following HVAC systems:

- 1) Zone I Area HVAC System
- 2) Zone II & III HVAC System
- 3) Zone IV HVAC System
- 4) Chilled Water System

General basis and assumptions utilized to establish sizing of systems and consistency with HWVP are as follows:

- 1) The design is based on criteria established by DOE order 6430.1A
- 2) The design is based on HVAC zoning as indicated on the WHC drawings that were provided.
- 3) Zone I air quantities are based on five air changes per hour.
- 4) Zone II air quantities are based on ten air changes per hour.
- 5) Zone III air quantities are based on five air changes per hour.
- 6) Zone IV air quantities are based on 1.1 CFM per square foot.

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3.2.11 Zone I HVAC Area System

The Zone I system for the stand-alone facility utilizes 100 percent outside air which is conditioned and supplied to the various areas through the air supply handling units. The exhaust air from these areas is routed through two stages of remotely maintained HEPA filters and one stage of contact maintained HEPA filters. The remote filters are located in a shielded room where a robotic EMM is utilized for filter changeout. Maintenance space is provided for staging and maintenance of the robot. Filter disposal is accomplished by compaction and placement into shielded containers.

The third stage of filtration is located in a man access area and the filters can be bagged out.

The Zone I exhaust fans exhaust the air to the outdoors by way of a combined stack with isokinetic monitoring.

Equipment rooms for the HVAC were enlarged to accommodate the HVAC equipment. In most cases, this required increasing the height of the rooms. The remote HEPA filter room was forced deeper into the ground to reduce the impact on the above ground structure.

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This system is patterned after the remote system designed for the Process Facility Modifications Project but expanded with additional filter plenums. Costs are established from the PFMP cost estimate.

3.2.12 Zones II and III HVAC Area System

The Zone II and III areas are served by an independent HVAC system using 100 percent outside air which is conditioned and supplied to the Zone III areas by supply air handling units. The air is conditioned and supplied initially to the Zone III areas.

The Zone III exhaust air is cascaded to the Zone II areas through a single stage of contact maintained HEPA filtration.

The exhaust air from the Zone II and III areas is exhausted through two stages of contact maintained HEPA filters. This exhaust is combined with the Zone I air down stream of the final filtration and routed to a common stack.

The stack is a grade mounted stand approximately 150'-0" in height.

Equipment rooms for these systems were expanded in height and square footage to accommodate the additional filtration equipment.

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3.2.13 Zone IV HVAC Area System

The Zone IV areas consisting of the Control Room, Offices, Change Rooms, Lunch Room and Toilets are served by an independent HVAC system. This system utilizes supply air handling units and return/exhaust fans to provide conditioned air to these areas.

Additional equipment room space is provided to accommodate this system.

3.2.14 HVAC Chilled Water System

The chilled water system provides chilled water to the supply air-handling unit cooling coils that serve all HVAC zones. This system consists of centrifugal chillers and the associated chilled water and condenser water pumps. The cooling tower is located outside in close proximity to the chiller room.

A room was added for this system which was not accounted for in the building layouts provided by WHC.

3.2.15 Electrical System

The electrical system provides normal and standby power for the facility. A single emergency generator is furnished to supply standby power to the Zone I exhaust system and safety related systems within the



facility. The emergency generator is estimated at 300 KW and is driven by a diesel engine.

The facility power is supplied by a single double-ended load center from the 13.8 KV feeders.

3.3 Integrated Pre-treatment Facility

3.3.1 General Description

A table (Table 2-1) comparing the Stand-Alone, Co-Located and Integrated Pre-treatment facilities is included in Section 2 of this report.

The salient features of the Integrated Facility are described as follows:

- 1) The facilities are located within an extension of the Vitrification Building of the HWVP, adding some 370'-0" feet to the North-South dimension of the Vitrification Building by extending the process cell and gallery area.
- 2) HVAC Systems, Utilities and Electrical power are expanded to include the Pre-treatment process.

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3) The Pre-treatment Flow Diagram (Fig E-1 of SD-WM-TA-015) has been modified to include additional feed and storage tankage for additives, plus additional modifications listed in the referenced table.

3.3.2 Cell Arrangement

The in-cell canyon arrangement reflects the full in-cell equipment list as modified by Fluor (Appendix B).

3.3.3 Process Canyon Size

Embedded piping and jumpers require a full 5'-0" to either side of 15'-0" wide vessels to the wall requiring the cell width to be 25'-0". Presently a 22'-6" width is shown for the east cell on drawing ES-800-12. It is anticipated that reconfiguration of equipment will permit a 25'-0" width where required; a narrower cell for smaller equipment can be provided so overall building width can be maintained.

Cover blocks are 43'-0" above the cell floor, to the underside, consistent with HWVP requirements. This is sufficient for the largest stack up of equipment (25'-0"H) and jumpers. Cover blocks are assumed to be 3'-0" thick consistent with HWVP. Shield wall thickness is assumed to be the same as HWVP

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for the full canyon length at both sides of the canyon.

Cell length is set by spacing in-cell equipment 3'-0" apart side to side. This spacing appears adequate for approximately 600 embedded nozzles (incl 20% spares) to be located at the gallery walls. A pipe trench is not feasible, therefore, in-cell remote (XMAS TREE) piping, consistent with the concept used in HWVP, is assumed for the approximately 90 in-cell connections that have been estimated as being required.

Shield windows or manipulators are not required for the chemical cells. Lighting and in-cell handling is accomplished via the canyon crane.

3.3.4 Canyon Crane

In addition to the existing HWVP canyon crane, a single 30 ton capacity version of the HWVP canyon crane with lighting, CCTV and the EEC is required. The crane will share the HWVP Canyon Crane rails. HWVP lifts are comparable so rail height and ceiling height per HWVP can be retained.

Bus bar corridor extension is required at the third floor.

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The crane maintenance area (and building length at South end) must be extended 20'-0" so the Crane Maintenance Area can simultaneously accept the two cranes. The shield door and decon systems designed for the HWVP can be utilized for both canyon cranes.

3.3.5 Master Slave Manipulator (MSM) Repair

Expansion of the HWVP MSM repair facilities is required by a factor of 40% (300 sq ft) to handle the greater number of MSMs utilized by the integrated facility. Each HWVP shop should be expanded equally. Adjustment of the Analytical MSM repair shop location is required to accommodate the extended east corridor, conceptually, access to the shop from the corridor will be unchanged. No additional decon glove boxes are required. General equipment needs and cost are increased proportional to the expanded floor area.

3.3.6 Regulated Maintenance Shops

Regulated maintenance shop space is provided equivalent to the stand alone facility lower west level corridor. Equipment costs for this new shop are assumed equivalent to the HWVP.

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3.3.7 Non-Regulated Maintenance Shop

An additional external single elevation metal building or expansion of the HWVP Non-Regulated Maintenance shop is required. Space and equipment equivalent to 50% of HWVP (2800 sq ft) is allowed. Access to non-regulated maintenance is from outside of the controlled areas only.

3.3.8 Failed Equipment Handling

Repair and disposal of failed in-cell equipment requires remote and contact maintenance space to allow prompt exchange of failed and replacement components by the canyon crane. A lay down area separate from the decon and repair cells is required to assure that this can be accomplished.

Maximum laydown area consistent with other cell configurations has been provided.

A significant fraction of the failed equipment will not be repairable remotely nor decontaminable to contact levels, requiring that it be disposed of in a Hanford standard disposal box. A remote cell is required for remote decontamination maintenance and size reduction (cut up), of failed equipment to be disposed of. A Failed Equipment Cut-up Area has been provided for this purpose. This cell will be completely lined with stainless steel. Four shield window stations with MSMs



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at the corridor wall, remote lighting fixtures, CCTV, utility services and decon solution supplies are furnished. In addition, two electro-mechanical manipulators are required to operate the in-cell equipment. As in the stand-alone facility, Process Facility Modification (PFM) project FECA equipment was used as the estimating basis.

Decontamination requirements to allow manned access into the failed equipment cut up area will involve lengthy procedures making it impractical. Also, loading of the disposal box, given the limited space and high contamination in this cell, is impractical. A separate, lower contamination manned access cell is required. This cell is capable of remote box closure and handling. It is equipped with two shield window stations, each with two MSMs. One EMM will also be required as well as a hoist system for component handling. This cell is fully stainless steel lined and equipped with utility supply and decon solution services.



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3.3.9 Sampling and Analytical Laboratory

Samples will be drawn in shielded caves adjacent to the canyon cells and the corresponding in-cell equipment. Four cells total (two for each process cell) will be required. Combined with these cells will be the remote analytical cells. Design will be comparable to the HWVP concept. A total of 35 sample assemblies are provided spaced at 1'-4" centers. Three sample caves will collect seven samples each (requiring 10'-0") plus 10'-0" for analytical work for a total inside length of 20'-0". The fourth cell will collect 14 samples and have two analytical cells for a total inside length of 40'-0". A single service room is provided between each set of sample/analytical cells in the two corridors to operate the sample transfer drawers servicing the cells.

Shielding for the sample cells is 28" of high density concrete on three sides. Equipment includes 10 - 28" deep shield windows, 20 MSMs and 35 liquid sample modules. In-cell equipment is comparable to HWVP except that four transfer drawers are required instead of two. Additionally, four pneumatic transfer systems are required for sending and receiving sample vials to and from the Laboratory.



The hot laboratory is located on the same mezzanine level to the North side of the sample cells. The HWVP laboratory is replicated, mirror image, for space allocation purposes. Equipment costs are assumed equivalent to comparable HWVP Facilities (Lab & three support rooms.)

A cold laboratory is required for analysis of incoming cold chemicals via rail or truck. A facility identical in size and cost to HWVP is assumed to be required.

3.3.10 HVAC Systems

The integrated facility is serviced by the following HVAC systems:

- 1) Zone I Area HVAC System
- 2) Zone II & III HVAC System
- 3) Zone IV HVAC System
- 4) Chilled Water System

General basis and assumptions utilized to establish sizing of systems and consistency with HWVP are as follows:

- 1) The design is based on criteria established by DOE order 6430.1A
- 2) The design is based on HVAC zoning as indicated on the WHC drawings that were provided.

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- 3) Zone I air quantities are based on five air changes per hour.
- 4) Zone II air quantities are based on ten air changes per hour.
- 5) Zone III air quantities are based on five air changes per hour.
- 6) Zone IV air quantities are based on 1.1 CFM per square foot.

3.3.11 HWVP System Expansion

Since the integrated facility is an expansion of the current HWVP design, it is necessary to expand the HVAC systems to accommodate the additional loads.

The increased loads have been accommodated by adding equipment and/or increasing equipment sizes of the existing designed equipment. The Vitrification Building Mechanical Room, Sand Filter, and Fan House, have been increased in size to accommodate the additional load. The chiller system capacity has also been increased.

The Zone I exhaust system is filtered, utilizing the existing HWVP design concept. This concept consists of a sand filter with a final stage of contact maintained HEPA filters.

3.3.12 Electrical System

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Normal and stand-by power for the expanded facility will be fed from the existing HWVP designed system.

Emergency stand-by power will be supplied from the existing design emergency generators.

3.4 Co-Located Facility

3.4.1 General Description

The salient features of the Co-located Facility are described as follows.

A table (Table 2-1) comparing the Stand-alone, Co-located and Integrated Pre-treatment facilities is included in Section 2 of this report.

- 1) The facilities are located within the 200 E Area of the Hanford Site as a new Stand-alone Cell Facility. The cell-facility is located adjacent to the sand filter and near the HWVP Vitrification Building.
- The pre-treatment process cell and related cells are located in a separate building with an independent HVAC Supply and Zone II, III and IV exhaust system. The Zone I exhaust system, sand filter,



HEPA filters, exhaust fans, and stack are shared with HWVP.

- 3) Several utilities are serviced from the expanded HWVP systems such as steam, air, cooling water, chilled water, etc.
- 4) The Pre-treatment Flow Diagram (figure E) of SD-WM-TA-015 has been modified to include additional feed and storage tanks for additives, plus necessary utilities and additional modifications in Table 2-1.

3.4.2 Cell Arrangement

The in-cell canyon arrangement reflects the full in-cell equipment list as modified by Fluor (Appendix C).

3.4.3 Canyon Size

Embedded nozzles and jumpers require a minimum of 5'-0" on each side of the 15'-0" diameter vessels to the well. This requires a minimum cell width of 25'-0". Cell length is set by spacing in-cell equipment 3'-0" apart this results in an overall cell length of 310'-0". The spacing appears adequate for approximately 600 embedded nozzles (including 20% spares) to be located at the gallery walls. Pipe trench and closed loop utility jumper embeds are less congested.



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Cover blocks are 40'-0" above the cell floor (to underside) which is sufficient to handle the largest stack up of equipment (25'-0"H) and jumpers. Cover blocks are assumed to be 3'-0" thick as at HWVP. Shield wall thickness is assumed to be 5'-0".

Shield windows or manipulators are not required for the chemical cell walls.

Lighting and all handling is via the canyon crane.

All canyon cell walls and floors are stainless steel lined to the bottom of the cover blocks.

3.4.4 Canyon Crane

A single 30 ton capacity 75'-0" span canyon crane equipped with lighting and CCTV will service all remote cells and the railroad well. Crane rails must be a minimum of 32 feet above the cover blocks for the maximum length component to clear. The distance above the crane to the underside of the roof is 12'-0".

A crane maintenance area is provided for a 20'-0" wide crane bridge. Depth comparable to HWVP Crane Maintenance Area is assumed.

A rising shield door is assumed (vs HWVP hoist system).



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3.4.5 Master Slave Manipulator (MSM) Repair

Expansion of the HWVP MSM repair facilities is required by a factor of 40% (300 sq ft) to handle the greater number of MSMs utilized by the integrated facility. Each HWVP shop should be expanded equally. Adjustment of the Analytical MSM repair shop location is required to accommodate the extended east corridor, conceptually, access to the shop from the corridor will be unchanged. No additional decon glove boxes are required. General equipment needs and cost are increased proportional to the expanded floor area.

3.4.6 Regulated Maintenance Shops

Ample space has been allocated in the facility lower level corridor. Equipment costs are assumed equivalent to HWVP.

3.4.7 Non-Regulated Maintenance Shop

An additional external single elevation metal building or expansion of the HWVP Non-Regulated Maintenance shop is required. Space and equipment equivalent to 50% of HWVP (2800 sq ft) is allowed. Access to non-regulated maintenance is from outside of the controlled areas only.

3.4.8 Failed Equipment Handling

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Repair and disposal of failed in-cell equipment requires remote and contact maintenance space to allow prompt exchange of failed and replacement components by the canyon crane. A lay down area separate from the decon and repair cells is required to assure that this can be accomplished.

Maximum laydown area consistent with other cell configurations has been provided.

A significant fraction of the failed equipment will not be repairable remotely nor decontaminable to contact levels. This requires that it be disposed of in a Hanford standard disposal box. A remote cell is required for remote decontamination maintenance and size reduction (cut up), of failed equipment to be disposed of. A Failed Equipment Cut-up Area has been provided for this purpose. This cell will be completely lined with stainless steel. Four shielded window stations with MSMs at the corridor wall, remote lighting fixtures, CCTV, utility services and decon solution supplies are furnished, in addition, two electro-mechanical manipulators (EMM) are required to operate the in-cell equipment. As in the previous alternatives, the equipment for the Failed Equipment Cut-up Area for the Process Facility modifications (PFM) project was used as the basis for the cost estimate.

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Decontamination requirements to allow manned access into the failed equipment cut up area will involve lengthy procedures making it impractical. Also, loading of the disposal box, given the limited space and high contamination in this cell, is impractical. A separate, lower contamination manned access cell is required. This cell is capable of remote box closure and handling. It is equipped with two shield window stations, each with two MSMs. One EMM will also be required as well as a hoist system for component handling. This cell is fully stainless steel lined and equipped with utility supply and decon solution services.

3.4.9 Sampling and Analytical Laboratory

samples will be drawn in shielded cells adjacent to the canyon cells and the corresponding in-cell equipment. Four cells total (two for each process cell) will be required. Combined with these cells will be the remote analytical cells. Design will be comparable to the HWVP concept. A total of 35 sample assemblies are provided spaced at 1'-4" centers. Three sample caves will collect seven samples each (requiring 10'-0") plus 10'-0" for analytical work for a total inside length of 20'-0". The fourth cell will collect 14 samples and have two analytical cells for a total inside length of 40'-0". A single service room is provided

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between each set of sample/analytical cells in the two corridors to operate the sample transfer drawers servicing the cells.

Shielding for the sample cells is 28" of high density concrete on three sides. Equipment includes 10 - 28" deep shield windows, 20 MSMs and 35 liquid sample modules. In-cell equipment is comparable to HWVP except that four transfer drawers are required instead of two. Additionally, four pneumatic transfer systems are required for sending and receiving sample vials to and from the Laboratory.

The hot laboratory is located on the same mezzanine level to the North side of the sample cells. The HWVP laboratory is replicated mirror image for space allocation purposes. Equipment costs are assumed equivalent to comparable HWVP Facilities (Lab & three support rooms.)

A cold laboratory is required for analysis of incoming cold chemicals via rail or truck. A facility identical in size and cost to HWVP is assumed to be required.

3.4.10 HVAC Systems

The Co-Located Facility is served by the following HVAC systems:

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- 1) Zone I Area HVAC System
- 2) Zone II & III HVAC System
- 3) Zone IV HVAC System
- 4) Chilled Water System

General basis and assumptions utilized to establish sizing of systems and consistency with HWVP are as follows:

- 1) The design is based on criteria established by DOE order 6430.1A
- The design is based on HVAC zoning as indicated on the WHC drawings that were provided.
- 3) Zone I air quantities are based on five air changes per hour.
- 4) Zone II air quantities are based on ten air changes per hour.
- 5) Zone III air quantities are based on five air changes per hour.
- 6) Zone IV air quantities are based on 1.1 CFM per square foot.

3.4.11 Zone I HVAC Area System

The Zone I system is served by an independent supply system with 100 percent outside air being furnished through air handling units. The air is conditioned and routed to the Zone I areas. The exhaust air is routed through ducting to the expanded HWVP exhaust system. The air is filtered through the expanded sand



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filter and final HEPA filtrations to the HWVP stack.

3.4.12 Zone II and Zone III HVAC Area Systems

The Zone II and III Areas are served by an independent HVAC system using 100 percent outside air which is conditioned and supplied to the Zone III areas by supply air handling units. The air is conditioned and supplied initially to the Zone III areas.

The Zone III exhaust air is cascaded to the Zone II areas through a single stage of contact maintained filtration.

The exhaust air from the zone II and III areas is exhausted through two stages of contact maintained HEPA filters. This exhaust is routed to an independent stack.

3.4.13 Zone IV HVAC Area System

The Zone IV areas, similar to those in the stand-alone facility, will utilize an independent HVAC system. The system utilizes supply air handling units and return exhaust fans to provide the required conditioned air.

Additional equipment room space is provided to accommodate this system.



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3.4.14 HVAC Chilled Water System

Chilled water will be supplied from the expanded HWVP system.

3.4.15 Electrical System

The electrical system provides normal and stand-by power for the facility. The electrical needs will be furnished from the expanded HWVP system. A local distribution center will be fed from the HWVP transformers and switch yard. Emergency power will also be supplied from the currently designed emergency generators.

4.1 Summary and Comparisons

Table 4-1 is a summary of the Total Estimated Cost (TEC) for the three pre-treatment alternatives. The total direct costs were estimated in accordance with Section 4.2, General Basis and Assumptions. The estimates for the stand-alone, integrated and co-located pre-treatment alternatives are discussed in Sections 4.3, 4.4 and 4.5 respectively. The contingency analysis is discussed in Section 4.6.

4.2 General Basis and Assumptions

In order to prepare the cost estimate for the three pre-treatment alternatives, several bases and

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TABLE 4-1. TOTAL ESTIMATED COST(TEC) SUMMARY - X \$1,000

COST CATEGORIES	STAND-ALONE	INTEGRATED	CO-LOCATED
Detailed Design	\$50,710	\$46,163	\$47,872
Field Engr & Inspection	\$19,873	\$18,091	i \$18,761 :
Construction	\$228,423	\$207, 943	! ! \$215,641
Engineering Management	\$19,188	\$17,467	! \$18,114
Construction Management	\$13,477	 \$12,269	 \$12,723
Project Management	 \$17,132 	 \$15,596 	 \$16,173
Total Cost (Fy 88 Basis)	\$348,803	\$317,529	\$329,284
Escalation	\$246,896	\$173,418	\$233,798
Contingency	 \$191,744	 \$158,969 	 \$181,879
HWVP Cost Impact	1	\$179,900]
Total Estimated Cost	\$787,443	\$829,816	\$744.961

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assumptions were established. These bases and assumptions are noted below:

- 4.2.1 The basic configuration of the stand-alone facility and the integrated facility used the drawings developed by WHC. Modifications were made to those drawings, only in those areas where current experience dictated that modifications were necessary. Those modifications are described in Section 3.0. There was not sufficient time to perform a detailed analysis of the modifications, however, the modifications appear justified based on current design experience.
- 4.2.2 HWVP unit rate pricing data were applied wherever possible. Deviations from HWVP pricing data are noted in the estimate basis and contained in Tables 4-2, 4-3 and 4-4.
- 4.2.3 Decontamination and decommissioning costs were not considered in the cost estimate.
- 4.2.4 The cost estimate was prepared on a Total
 Estimated Cost (TEC) basis. Expense funded
 costs such as Conceptual Design, Research and
 Development, and pilot plant development were
 not estimated.
- 4.2.5 Detailed Engineering, Field Engineering and Inspection, Project Management, Engineering Management, and Construction Management costs

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were included using the comparable percentage of direct cost in the HWVP cost estimate.

- 4.2.6 The pre-treatment plant availability was assumed to be 50%.
- 4.2.7 Escalation was calculated using the HWVP escalation index applied to the schedules included in Sections 4.3, 4.4, and 4.5.
- 4.2.8 The direct cost basis was mid-FY1988. HWVP direct costs and direct costs extracted from the PFM Facility were escalated to mid 1988.
- 4.2.9 Schedules assumed that a fast track approach to technology assimilation would be applied to the Integrated Case. Both the Co-Located and Stand-Alone Cases assumed a more significant technology demonstration and documentation step would be required in parallel with the validation step.
- 4.2.10 Feed supply/return lines were not included in the cost estimate.
- 4.3 Stand-Alone Estimate and Schedule
 - 4.3.1 Stand-Alone Estimate

The stand-alone pre-treatment facility was estimated as a separate facility. The direct



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cost estimate for construction and procurement, as well as the estimate basis is shown in Table 4-2. Included at the end of Section 4-6, is a priced equipment list for the stand-alone pre-treatment alternative.

4.3.2 Stand-Alone Pre-treatment Schedule

The schedule for the stand-alone pre-treatment facility is shown in Figure 4-1. The stand-alone schedule is characterized by dual critical path. The first critical path flows through the conceptual design and advanced conceptual design to support the Environmental Impact Statement and RCRA and then through engineering and construction. The second critical path flows through the pre-treatment pilot plant and demonstration of the pre-treatment process for preparation of the technical data package. It may be possible to accelerate the second critical path based on a more detailed analysis.

An additional observation, regarding the stand-alone schedule, is that the schedule shows a requirement for capital funding in government fiscal years 1993 and 1994 which are the peak years on the HWVP budget authorization (BA) profile. However, the requirement for the large capital expenditures for construction occurs in mid 1996 which is later than HWVP peak BA funding



requirements. The funding interface should be a subject of a future review.

4.4 Integrated Pre-treatment Estimate and Schedule

4.4.1 Integrated Pre-treatment Estimate

The integrated pre-treatment facility was estimated by combining the pre-treatment process with the existing HWVP facility. The direct cost estimate for construction and procurement and the estimate basis is shown in Table 4-3. The priced equipment list, for the integrated pre-treatment alternative, is included behind Section 4.6.

The integrated pre-treatment Total Estimated Cost (TEC) includes a cost impact for HWVP. The additional cost incurred by HWVP is due to escalation for a three year delay from the current schedule as well as additional costs for Detail Design (18 month delay), Project Management and Construction Management due to the three year extension of the construction schedule.

4.4.2 Integrated Pre-treatment Schedule

The schedule for the integrated pre-treatment facility is shown in Figure 4-2. The critical activities for the integrated pre-treatment schedule are the preliminary design for integrated pre-treatment such that

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the pre-treatment design requirements can be integrated with the HWVP base design. The result of integrating pre-treatment with HWVP is an 18 month extension to the completion of Detailed Design and a three year delay in the start of construction.

From a budget authorization (BA) viewpoint, the integrated pre-treatment schedule funding profile requires construction funding in the second half of fiscal year 1993 which is the peak BA requirement for the current HWVP BA profile. The BA funding profiles for the integrated pre-treatment facility should be reviewed in additional detail.

4.5 Co-Located Pre-treatment Estimate and Schedule

4.5.1 Co-Located Pre-treatment Estimate

The co-located pre-treatment facility was estimated by combining HWVP with a co-located facility which would utilize existing HWVP services. The direct cost estimate for construction and procurement, including the estimate basis is shown in Table 4-4. Included behind Section 4.6 is a priced equipment list for the co-located pre-treatment alternative.

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C-276 HASTELLOY C-276 HASTELLOY C-276 HASTELLOY C-276 15 STAINLESS LONG 15 STEE LONG 15 15 15 15 15 15 15 15 15 15 15 15 15		ا ا	Parcess Cerc	TRANSPER FULL F
C-276 HASTELLOY C-276 HASTELLOY C-276 FASTELLOY C-276 5TAINLESS	29000 6AL 15	<u> </u> 	PROCESS CELL	SLUDGE RECEIVER A
	10 BPX NS	<u>-</u>	PROTESS TELL	CONTENSET DEFENTACINES
		<u> </u>	PADCESE CELL	DISSOLVER A SAMELE PUMP A
<u>-</u>			553004d	DISSOLVER A ABITATOR B
C-276		-	PROCESS CELL	01550_VEF + AGITATOF A
HASTELLOY 246			FROCESS DELL	DISSOLVEN A TRANSFER PURK E
#ASTELLUT 246 C-276		<u> </u>	PROCESS DELL	DISSELVER A TRANSFER FUNE A
15.WIDE) 15.5' HASTELLO: 2.135 HIGH X 27'LONG C-276	42000 6AL 15	 	PROCESS CELL	\$1850LVEF #
()	CAR HCCC.	- E	10C>10W	ITEM

10 10 10 10 10 10 10 10 10 10 10 10 10 1	PROCESS CELL			1	STATNLESS: 94
NOT TOWERS & A D Y 20 H, W/		*		15 WIDE 1 15 WIGH) 20 LONG	un t
TRANSPER PUNE A	PROCESS CELL				
NOX TOWERS PUNE 8	PROCESS CELL	j			
RECOVERED NITRIC TANS	FROLESS CELL	<u>'</u>	32000 BAL	15.WIEE 7 15.5" HIEH X 22'LONG	STAINLESS
PECOVERED WITRIC TANK TPANSFER PUMF A	113) 5530t4	-			
RECOVERED NITTED TANA	รษายา ระสายช	-			
RELOVENED NITRIL THAN ABITATOR E	1132 5530884				
Siesentas ees ees	PROCESS CELL	-	28000 6AL	15 WILE & 15.5 HISH & 20 LONS	STEEL STEEL
THANGFER FUNE A STEIVER A	FROCESS CELL				
AGITATON A AGITATON A	PROCESS CELL	 -			
AGITATOS B	FROCESS CELL	-			
SUPERMETE FEED/KETEIVER B	PROCESS CELL	 	280% GAL	15.MIDE X 15.5.	STEEL
SUPERNOTE REEDIRECEIVER B	PROCESS CELL				
SUPERATUR FEED/RECEIVER B	FROCESS CELL	-			
SUPERVATE PEED PECETVER B	PROCESS CELL	 			
TON TEVET MESTE JAM Y	PROCESS CELL		465.69 GAL	15 RITE Y 15.5 H16H > 27 LONG	STEEL
LON LEVEL NASTE TAN) A TRANSFER PUMP A	PROCESS CELL	<u>-</u> -			
LOW LEVEL WASTE TANK A	PROCESS CELL				
LOW LEVEL WASTE TANK &	אעסכבני כברר	-			
LON LEVEL WASTE TAKE B	PROCESS CELL		199 (-) GAL	15 WISE 1 15.5 HIGH X 27 LONG	STAINLESS
IRANSFER PUNF A	PROCESS CELL	 			
LON LEVEL NASTE TANI B	PROCESS CELL				
TOH LEVEL HKSTE TAND B	PROCESS CELL	 -		· .	

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	LOCATION		CAPACITA	NOTENBELL	MATERIAL (\$
52 PRODUCT 23849672 1301038 53	PPOCESS CELL		5000 68.		STEEL
CS PAUL TO STORAGE	PROCESS CELL				
	BECTESS LETT				
171 171 171 171 171 171	PROCESS CELL		1000 640		STATHLESS
OLING COIL	PROCESS CELL		. 		
TEANGER FORE A	SECURE CELL	<u>-</u>			
PETATON FECETARY	PER SERVICES	 			
	PROCESS CELL		14000 BR	13.5 PIG Y	STRINLESE
I* PROD RETEIVER COOLING COIL				11.0	
TRUCKER PERSON A	PPOCESS CELL				
1 E 1 - 4 - FE 1 E	PRICESS CELL		TARRE ENC.	1918 S 1818 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	STAIRLESS"
IN EFRAMI BECACTE COOFTHE COIL!		- 		l	
TRUNKER PURE A	PROTEST CELL	<u>!</u>			
BETTAL BETAGE	PACESS SELL	<u>-</u>			
In Putt Take	PROCESS CELL		1000 641		SIEEL
בסבואה בכוב					
THANSFEE PUNT 6	PROCESS CELL				
T. FURF TAIL	PROCESS CELL				
IN MASTE RECEIVES	PROCESS CELL	. <u></u> 	20:0 641		STEEL SEEL
IN MAGIE RECEIVER COGLING COIL			- 		
TRANSFER FUNT A	PROCESS CELL	<u> </u> -			
1) WASTE RECEIVEN ABITATOR 6	PROCESS CELL	<u> </u>			
IX FEED STORMSE	PROCESS CELL	<u> </u>	14000 6AL	13.5 HBH X	STAINLESS
Ix FEED STORAGE COOLING COIL					
IX FEED STOPAGE TRANSFER PUNF A	PROCESS CELL	<u> </u> 			
IX FEED STORAGE	PROCESS CELL	<u> </u> -			
SUPE COLLECTION TAIN	FROCESS CELL	<u> </u> -	- 3000 EAL	HOTH ATO AT	STEEL HISTAINLESS
SUME CLLCTH TANK COOLING COIL					
SUMP COLLECTION TANK	PROCESS CELL	 		<u>-</u> :	

4 1 2 2 1 1 4 6 9 3

			<u> </u> 	PROCESS CELL	SOLVENT SERVOLS INTA TOS
				PROCESS CELL	SCOVERT STOKAGE TANK TRANSFER PUMF A
STEEL	6.Bly X 10.HlgH	4000 EAL	-	PROCESS CELL	SOLVENT STORGE TK COOLING COIL
			<u>-</u>	PROCESS CELL	SOLVENT WASH WASTE TANK
				PROCESS CELL	SOLVEY WASH WASTE TANK
,					SOLVENT MSH WST TY COOLNS COIL
STAINLESS	8 DIN V 10 HIGH	4000 BHL	<u> </u> -	PROCESS CELL	SOLVENT WESH WASTE TAN
			<u> </u>	FROTESE CELL	SC_VENT FEED TANK ASTIFIER A
			 -	SEDUCESS CELL	SOLVENT FEED TANK
ייייייייייייייייייייייייייייייייייייי			·	* * * * * *	SOLVENT FEED TAN COOLING COIL
STATINESS !	8 DIA) 10 HIGH	4000 BAL	-	PROCESS CELL	SOLVENT FEED THE
			 	PROCESS CELL	HESTE RECEIVER TARK
			<u> </u> 	PROCESS CELL	TRACTE RECEIVER TANK
3318					
STAINLESS	10 DIK X14 HIGH	8000 GAL	<u> </u>	PROTESS CELL	STORM RECEIVED (SEC.)
			<u> </u> 	FROCESS CELL	FEED POWS 15N1
				PEGCESS CELL	FEEL PURF A
					FEED PURF TARY COOLING COIL
353 N 1915	10 DIR 714 HIGH	Beibe SAL		133 ESE (ELL	FEET PURP TAN
			<u> </u>	##0255 2530##	FEET RIVE UP TANK
				PAGGESS CELL	# EEEE
	· •===	,			FEED MAIE OF THRU COOLING COIL!
51551 5161151555 5161151555	10 E14 114 E15H	B)(12 5AL	버	PROCESS CELL	FEED MAYE OF TANK
				PROCESS CELL	NH3 OFFGUE SCRUBEER RECVE TANK ABJITATOF A
			<u> </u> -	T133 SS320%4	NHS OFFBAS SCRUBBER RECVE TAN) TRANSFER PUMP A
			·		NHT DEFES SCRBE REV TK CL COIL
STEEL	N. 6 1 91	4000 GHZ		PROCESS CELL	NHS OFFERS SCHUEBER RECYP TANK
				PAGCESS CELL	SIMS COLLECTION TANK
. -			. <u>.</u>		_

y | 1 2 = 1 + 1 5 9 4

1-4 	LOCATION !	310	CAPACITY	DIMENSION	MATERIAL (S / 1900)
THU PRODUCT RECEIVER	PROCESS CELL		1400 BAL	H9TH 6 1 9TG 3	STAINLESS !
TRE PRODUCT RECAR COOLING COIL	***				
TRU TELLUC PECEIVER TEAUCICE PUMP A	PAUCESS CELL				
TRU CONTENIENTS & STRIFFER	PROCESS DELL	-	1407 641	H9IH .9 x 910.1	HASTELLOY
TRU CONCENTRATOR CONSENSER	FRUCESS CELL	4		3015 101	STAINLESS
CONCENTENTED TRU RECEIVED A	PROTESS CELL	-	Pigg ett.	10 114 VII HIBH	STEEL
CONCILL INC. ECAE Y COOCHE COIT		,			
COMPENSATED FOR PECEIVER A	1133 SE3384				
CONTERTORIES THU RECEIVED A	1131 \$530639	J			
<u> </u>	PROCESS CELL		9000 EAE	16 III 911 01	514114-E55
CONCURT THE ROWS E COOLSE COIL					
TOWER FLAR A	PROCESS CELL				
CONTENTATION FEEDINGS B	SECTION CELL	4			
TRU COMPENSATE RECEIVER	PROCESS CELL		3000 BAL	H91H 01 1 710 8	STAINLESS
THE CHOICENTE RECVE COOLING COIL	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	-			
TRANSPER PLAP A	PROCESS CELL			·	
THE CONDENSATE RECEIVER	PROCESS CELL				
REGENERATION WASTE THUS	PROCESS CELL		1600 621	4914 OT 1 410.14	STATHLESE
REGENERAL WETE IN COOLING COIL					7
54: EJT,1E8 #	ביניניים נפרר	<u>-</u> -	20 6FK	SN07 3 (0.2)	STATISTESS
PHF FILTER B	PROCESS CELL	<u>-</u>	20 6PK	2 b) 8.TON2	STATINLESS
PRECOAT FEED TANK	PROCESS CELL		100% BAL	H.91 (9.4	STAIKLESS
PRECONT FEED TANI COOLING COIL					
PFETOFT FEET TANK TRANSFER FUMP A	PROCESS CELL	<u>'</u> -			
PRECORT FEED TAKE AGITATOR A	PROCESS CELL				
NHS SCRUBEER CONCENTRATE RECVE	PROCESS CELL	 	1000 BAE	5 D X 7 H	STEEL
NH3 SCREE CONCH ROVE COOL COIL					
RAJ SCRIBBER CONZENTRATA RECUR PROCESS CELL THANSCER PUMP A	FRUCESS CELL	<u>'</u> اـ			
APS SCRUBEER CONCENTRATH RECVE:PROCESS CELL FEITATUR A	F FROCESS CELL	<u>.</u>			

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. m	STAINLESS	H.S. X. 410.49.8	500 641	-	IN BLDG/OUT-OF-CELL	STRIP SOLUTION FEED TANK
.to				<u>-</u>	IN BLIG 7001-DF-CELL	SCROP SOLUTION FEED TANK POITATOR A
حد				-	IN BLDS/OUT-OF-CELL	SCAUG SOLUTION FEED TANK
18	STAINLESS	4 6 51A X 5 H	200 641	H	IN PCD6/001-0F-CELL	SCHUB SOLUTION FEED TANK
39,725						TOTAL IN-CELL EQUIPMENT
7	STAINLESS STEEL		25 6PH	-	PROCESS CELL	SIRE JETS
1 (J1	STEEL STATIFIES			설	באסכב25 כברר	5130 141
230	STEEL STAINLESS		1500 SCFR		PROCESS CELL	0FF-6H2_E1T1EF
16	STEEL STEEL		1500 SCFM	-	PEOCESS CELL	0FF-645 HEXTER
151 151	STEEL	3 D 7 7 H	20 BPH	-	PRICESS CELL	CONDENSES CONTENTATOR
197	STEEL STEEL STEEL	H. 21 Y J. 9		-	FROCESS CELL	(MA) GEFTSES SCRUETEF
.F. 1.4	STEEL	15 K	20 6FW		FFCCESS CELL	SCHOOL SC
6.1 11 0	STEEL	2 1 7 6.1		-	191 533 084	CE CONCENTRATOR CONFENSER
153 153 154	STEEL LESS	15 'H	16 GFH		PRCCESS CELL	CE CONCENTESTOR
167	STEEL	F D X 15"H	30% 6%		133 553 544	T+ 050,07K
œ		1 5 7 6 H		\dashv	FRACES SEL	1) 2017EN, CCTORY
puri puri puri	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	10 m 10 m 10 m 10 m			ARGIESS CELL	1805: 3500501 805- 801318-5
pink 10e 1fe:	57 EEE EEE EEE	#000E 4.8.10 C X			78. 18. 18. 1	TRUE STRIFTER ADVICE
ju v 1,d 61	nin HT	MODULE 4 F F E L) B H			becores cell	TRUET SCRIE MODULE SCRUE CENTRIFUENC CONTACTORS
gun Ed Eb	STAINLESS STEEL	# H 12 F 3	13.03	-	PPOCESS DELL	TRUE ETTRACTION HOULE ETTROIN CENTETFUBEL CONTACTORS
					PROCESS CELL	- 1
n					PROCESS CELL	(AR) SCHUCKER CONCERSOTE RECVE TRANSPER PURP E
0	1/100 m 20 m 20 m 20 m 20 m 20 m 20 m 20 m		4 000 64€	\$	AND LEFT	NET SCRUBBER COMBENSATE RECYR
					0.2	¥ .

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	STEEL	0 524 2 2 2	349 066		IN BLD6/001-04-05FT	TRE-COPT FEED TANK
'i 				-	IN BLD6/OUT-OF-CELL	TAN)
<u> </u>				1	IN BLD6/OUT-OF-CELL	3.0K SODIUK HYDROFIDE ADDITION TAN: - TRENSEF FUNF A
L <u>"</u> 1	STAINLESS	4.9.DIB X 2.H	500 GAL	Н	IN \$C06/001-0=-CELL	3. DK SCETISK HYDROXIDE ADDITION TANK
				-	IN 5LD6:Dij1-DF-CELL	0.5K SECTOR HYPROTOE ADDITION TAKE - ASTIFICE A
!				-	IN BLDG/DUT-DF-CELL	O. SH SODION HYDROYITE ADECTION TAND - PUNE A
	STEEL STEEL	4 6 DIC X 5 H	500 BAL	-	IN BLDG/DUT-OF-CELL	0.5K SORTUK HYDROITE ADDITION TAKK
				-	IN BUTS FOOT FOR SELECT	ACTA KITEIC ACID ADDITION THAT
!					IN BLIFF DOT-FF-CELL	TEAMSTER FOR ACID ADDITION TAND
	SIEEL	4.5 (Hid-7.8	389 903	-	14 8135 001-05-(ELL	CIR KITRIC ACID AMITTOL TANG
}				-	IN BLES OUT-OF-CELL	HELLELDE 4 HELLELT TOTAL TOTAL TANK
[p	1737-40-480. 9074 VC	C.IK WITHIT FEID ABUTTION TANT TRUNSFER PURF A
	S:EEL S:EEL S:EEL S:EEL	4 6"DIF) 5 H	759 905	-	1132-10-116, 90.1E HI	THE RUTE OF ACTO ADDITION TABLE
					1N E 36 60: -0F - CELL	IT REBEDIEFATION HAVEUF TANN HETTATUF H
1					77 <u>3</u> 5-48-190, 247-41	15 REGENEFATION MAKEUF TAKI TRANSFEF FUNF A
]	215ET 21714TE25	4 6 01H 1 5 H	500 BHL		1337-30-100,907-4EEE	II REGENEFATION MATEUR TAN
				-	IN PLDE. OUT-06-CELL	SOLVER MAREJE TAKS
				-	11 8C10 00 - 0F-CELL	TRANSFER FURS A
	57 E E E E E E E E E E E E E E E E E E E	4 & P. A. S. H.	500 PA	-	IN BUDGYOUT-DE-CELL	SOLVEN' MAKEUF THAN
!				Н	IN BEDG. GGL-DE-CETL	WASH SOLUTION FEEL TANN ASSTATOR A
				-	1737-90-100:9018 41	TRANSFER PUMF A
	STEEL	4 20012 1 5 4	560 BE	늬	IN BERGON-OF-CELE	WASH SOLUTION FEED TANK
				•	IN BUDG DUT-OF-CELL	STRIF SCLUTION FEEL TANK ABITAIDE A
				-	IN BLD6:001-0F-CELL	STAIR SOLUTION FEED TANK
. Oit 5 1 1						

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			-	IN BLIG/OUT-OF-CELL	TY NECTED TEN
STEEL STREET	6 0 H	500 6HL		IN BUDG/DUT-OF-CELL	IX HATEUP TAIL
1			 	TH BLDG/001-0F-CELL	UTTLITY TANK. AGITATOF A
	<u>,</u>		-	IN PC06/0/11-06-CELL	OTILITY TANK TRANSCEP PUMP A
STEEL	# C C C H	500 BAL		IN ELIG/OUT-OF-CELL	OTILITY TAK:
-			-	IN BLDG/BUT-OF-CELL	OFF-645 TREATKENT SOUTUK NITRITE TANY - AGITATOP A
			-	W BLEG/DUT-DE-CELL	NITRITE TANY - TRANSFER PUNE
STEEL	4.6°01# % 5 #	500 GAL	-	IN BEDG/OUT-OF-CELL	OFF-6AS TREATMENT SOUTUK
			•-	18 BLD6:0011-06-CELL	ABITATOF A
				IK BLDG 'DUT-DF-CELL	I) MAKEUF TALL (CE)
TEEL	16 E	500 GAL		IN BEDG/OUT-DF-CELL	IX KAVEUP TANI (CE)
			- -	IN REDG/OUT-OF-CELL	NITRITE ADDIN TANY-ABITATON A
			•	22	HITRITE ADDM TW-TRAMSER PUNK A
SIEEL	4'6"DIA) 5 H	500 BAL	اسو ،	IN BUES-OUT-OF-CELL	HITFITE ADDITION TAKE SOLIUM
				N. RE00-001-06-CELL	SITELIE ADDIN TAN)-ASITATOS A
				IN BLIEVOUT-DE-CELL	VILLEGE SECTION 1814-BOLD BY S
STEEL	4 5 7 9 15 15 H	500 Bec	ا	14 \$1.65.004-08-CELL	STORE RELEVANTED THE
			ا 	II. BLOG OUT-DF-DELL	PARTY CASE BEEN TARE
				1737-46-40 9478 41	PERGIFOR PEEC TAX
SOUTH THE THE THE THE THE THE THE THE THE T	5 T	900 BHL 14		7133-10-106 9478 ME	PERBUIDE FEED THIN
			ا	IN BLD6/001-0F-CELL	<u>12k NITFIC ACTS ALBITION TANI</u> ABITATOS A
			,	IN 8'16'.001-04-CELL	TRANSFER FUMF A TOTTION TAN
STAINLESS	4,5 X HG.9	500 BAL 4		IN EC16-2013-05-CELL	IZK NITRIC ACID ADDITION TAGE
				IN BLDG/DUT-OF-CELL	PRE-COP FEED TANK ABITATISE A
				IN BLDS 001-05-CELL 1	FRE-COAT FEEL THAN TRANSFER PUNF H
			 	٠.	ŗ

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			-	NOT IN BLOG/	18F RECEIPT/STORAGE TANI
STAINLESS	7 (°D) 7 0°	2000 BAL	닉	OUT-OF-CELL	TBF RECEIPT/STOFAGE TANK
			-	NOT IN BLDG/	NOW DECEMBER 1988 TRANSFER FUND A
STEEL STEEL	7 0°5 X 7°6°	2000 SAL	-	NOT IN BLDS/	NPH RECEIPT/STORAGE TANI.
			-	NOT IN BLDG/	WASH SOLUTION MIX TANN ASITATOR A
			4	NST IN REDG	
SIEET SIVINIESE	7.0°D X 7 0°	2900 BAL	Ч	NOT IN BLOGT	HASH SOCUTION KIT TAND
	·		-4	OUT-OF-CELL	SIFJE SO WIJON KI: TANI HOITAGOS A
			ا ــا	NOT IN BLOS	STELF SCUTTON KIT TAKE
STEEL	7.0°D 7 7.0° H16H	2070 661	4	OUT-OF-CELL NOT IN BLOG?	STRIF SOLUTION MI) TANI
			Н	NOT 14 8006/	SCRUB SCLUTION RIVIANI REITHTSE A
				FUT-OF-CELL	SCRUZ SELUTION NIX TANI TRANSFER PUNE A
STEEL	7 9*D 3 7:0"	2040 BAL		DET TW FLDG.	SCETS SOLUTION MIT TAN
			텨	AGT IN BEEG	HALEDZEY ERUCTOR PULLED IN
ALUKINUS	9.0% X 40.TDM2	20000 642	;=	BOI-OF-CELL	HYDROGEN PERSITOE STORAGE TI
			اب.	NOT IN BLICE	TRANSFER FLAT A
215 101 101 101 101 101 101 101 101 101 1	15 0°5 7 15 6°	20000 BAL		NOT IN BLOS/	SODTUM HYDROTIDE STORAGE TANK
				WITT THE FEET	TRANSFER PURE &
201418 201418 201418	19 0.[) 12 9.	20000 BHL	-4-	NCT IN BLES	NITEIC ACID STOFAGE TAN
	•				TOTAL COLD CHEMICAL IN BLDG
				IN 8156 OUT-OF-CELL	ELUAN AZETTIĞE TARI ABITATOF H
			-	IN BLUG OUT-OF-CELL	ELUANT AUCKTION TANK
STAINLESS	4.5 X 910.9.4	749 905	4	IN REDE OUT-OF-CELL	ELDART ALCTION TARN
				IN BUDE OUT-OF-CELL	1) MATEUR FAMI
-					

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HEN	LDCATION	Y79;	CAPACITY	DIMENSION	HATERIAL !	1000
CHES RIV YEAR	OUT-DE-CELL	4	500 BAL	H16H H16H T4.2.1 2.0.	131 N 151 S	
TRANSEE PUNE A	NOT IN BLDG					•
CHEO RIS TARE	NOT IN PLES!					
SOLVER" MJ) TAKI	OUT-OF-CELL		500 BAL	4.5.D X 2.0.	STEEL	α) —
TRANSFER PUKE A	DUT-DE-CELL	-				F•
SOLVER KIX TAN)	NOT IN BLUG.	-				
KITED FOR DILUTION THAT	OUT-DE-CELL		50% 6AL	H16H 4 C 7 7 5 01	13318	<u></u>
HITALE ACTO DILUTION TANK	FOT IN BLDG	cal				
NITETE ACTO DILUTION TAND	OCT-OF-CELL NOT IN FLIG	ω				
SDETUN HYGFO/TOE TOLLUTION THIS	1130-16-05TF 101 18 8TP9/	N	500 BAL	4 6°D X 5 0°	STAINLESS	L±.
SOUTH HADROWISE DITHING LYNIA LAWA	NOT 14 BLD6/	1				
ASTTATOF A STEEPE BILUTION TANK	NOT IN SLOG	72				
SOLIUN MITAINE MIX TANS	DEL-DE-CETT HOL IN BITTE		50: 6AL	H16H 4.9.5 X 2.0.	SEET	⊞
SEDILA ELIFITE MITTAN)	NOT IN BLDS					
BETATOR A STEET BY THE	NOT IN BLES!					
PRECOST SIX TARE	NOT IN BLOG	-	50º 6AL	4 6°D X 5 0°	3315 331815 3537NF815	18
FECCUT NI) THAN	NOT IN BLIG	 -				
PRETERT HIX TANI ASTRATOR A	001-06-CETT 001-10 BCD0/	-				
TOTAL COLD CHEMICAL DUT OF BLDS						1,210
REG MAINTENANCE EQUIPMENT	REG HAINT SHOP					500
NON-REG MAINTENANCE EDUIPHENT	NON-REG SHOP	===				178
MSH REPAIR EQUIPMENT	RSK REFAIR					164
TOTAL REGULATED, NON-REGULATED	# MSM REPAIR	Ì				916

1 1 2 1 1 7 9 9

9,837					7	TOTAL REMOTE HANDLING EQUIPMENT
	STAINLESS			-	EC C	FECH REMOTE LIGHTS
1,122				9	CUT-UP ROOM	CUI-UP ROCH EQUIPMENT
263	STAINLESS		36 160	9	CAN-OH	CRAKE BLOCUS, YDIES, & BAILS
b m	STEEL			Ì	98	CHA SHIELD TOCK MOIST
1-2 12	STEEL		7.5 TON		COHC	CONT. CARE
	STEEL				स्यास्त सुरुष्टः	SHIELD WINDOW (PE)
7.7	13318 163187		SINFLE		85% FEFE	838 C2613
2,155	STEEL		FH 300	64	KENDIE KAIH CELLS	ELECT RECK MARGE JLATCE E
1,765	STAINLESS		Hobel F	2	THE TOUS REPORE CELLS	MASTER ELATE MATIPULATURS
774	1541 PL455			片	SHAPLE KENDIE CELLS	26. PHIET MINEOFF
,1 (1)	1640 GL 455			6-	MAINT. REMOTE CELLS	FO. BRIETD KINEORE
7 80 • n	STEEL	75 7 11 7 20	30 TOX	J	CAHTON BUT-DF-CELL	CEPIE
1,911						TOTAL ANALYTICAL FACILITIES
10				3	1997 TYS	CCTE TYP EOOTENETIS
368,1	SIEEL SIEEL			0.		אמי באנ בסטוויוצאו
2.390						TOTAL PROCESS SAMELING
I,265	25271E252		15 KL	띪	SHARLE CETTS	SAFFLE MODULES
623	STEEL .	2 1 2) 2			SHRETE/HWETAL BOOM	TRANSFEE DEFACES
1,77					MAINTENANCE	TOTAL EQUIPMENT DECON PEPAIR &
<u>с</u> н <u>г</u> н				3		ONE DECON EQUIPHENT
7.5	STAINLESS				Nor Repair	DECON ELOPE BU
j Or da H)	STEEL	• • • • • • • • • • • • • • • • • • • •		حد.	ANALYTICAL CELLS	PNETHATIC TRANSFER SYSTEM
10000	7	DIMENSION	CAPACITY	19 Y	101	

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1 mg

COST CATEGORIES	DIRECT COST X 1,000 (1988 \$)	ESTIMATE BASIS
		PERFORMANCE DATES
Temporary Construction	\$2,500	Allowance of 80% of HWVP temporary construction
Site Prep	\$960	Allowance of 80% of HWVP site prep, MTO for clearing
Structures	\$59,528	Quantities based on drawing MTO Applied HWVP unit installation rates
Fire Protection/Detection	\$2,000	Allowance of two times HWVP RCD estimate for Vit Bldg
HVAC	\$14,629 	Vendor quotes for supply and exhaust fans and HEPA filter plenums Robot system added from PFM facility escalated to 1988 Equipment factored ductwork and dampers/diffusers Cooling tower included with utilities Stack included with structure
In-Cell Pipe	\$14,888 	Jumpers - MTO based on equipment count Embeds factored using HWVP data Hot pipe trench MTO
Electrical Supply	\$1,5 9 3	MTO allowance from HWVP
Electrical Distribution	\$5,720	Capacity factored from HWVP
Process Utilities	1 \$18,159 	Capacity factored from HWVP
DCS System	; \$12,896 	Equipment factored from PFM Installation factored from HWVP
HP System	\$10,560	Equipment factored from HWVP
Communications	\$250	Allowance from HWVP RCD estimate
Remote Handling, Sampling, Analytical & Maint Repair	1] \$21,352 	Equipment factored estimate, see priced equipment list
Process Equipment:	1 	,
In-Cell Equipment	1 \$50,292 	Equipment factored estimate, see priced equipment list
Cold Chemical - In Bldg	; \$4,123 !	Equipment factored estimate, see priced equipment list
Cold Chemical - Out of Bldg	; } \$6,685 !	Equipment factored estimate, see priced equipment list
Construction Startup	\$2,288	Factored from HWVP direct construction costs
Operations Control Building	\$0 I	, -
TOTAL DIRECT COST	\$228,423	

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Park.

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FIGURE 4-1 PRE-TREATMENT PLANT SCHEDULE STAND ALONE

			AND ALONE		
	; ; cy 89 ; cy 90 ; cy	91 CY 92 CY 93 CY 94	; CY 95 ; CY 96 ; CY 9	7 ; CY 98 ; CY 99 ; CY 00 ; CY 01 ; CY 0	2 ; CY 03 ; CY
	FY 89	; FY 92 ; FY 93 ; FY 94	FY 95	; FY 98 ; FY 99 ; FY 00 ; FY 01 ; FY 02	FY 03
ILLESTONES	Concept Flw Diagr/Equip List		Apprvd	TIME SCALE CHANGE	
	Concept Design Complete	. Proj Hgmt Plan Apprvd	▽		• •
	Prelim Economics &	♥ 	. Approval to		• •
	Plant Location Decision .	• • •	. Commence Construction . ✓ .		
REGULATORY COMPLIANCE	EIS	RCRA Part B . PSAR	* * *		
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PRE-TREATHENT PLANT	Prelie Dasign HWYP		- · · · · ·		•
	Detailed	Design RKVP			• •
	.	Construction	HWYP	<u> </u>	• •
	Stdy of Alternatives .			Cold Testing	• •
	Conceptual .		• • •		• •
	Design . Va	lidation . Preliminary Design	<i>i</i> : :		
	A A Advance	d Conceptual 🐧 🐪 /	Detailed Design		
		Prelim: Drft Final Approd			
	Data Sht , Final .	. Tech Pkg! Tech Pkg! Tech Pkg			•
	Data Sht .				: :
			. "Site Prep .		
LECKNOTOCA	Short Form Data Sheets	. Technology Package		Construction Pre-Treatment	· ·
	Design PP Construct Pilot Pint	Demonstrate Pretreatment ¦ .			Cold Testing
file:pretrt3	:	•			

100	551 304L			Ĥ	PROCESS CELL	SLUPGE RECEIVER R
253	SST 304L	**		H	PROCESS CELL	SLUGGE RECEIVER B ASTIATOR B
64 83 83	SST 304L				FROCESS CELL	SLUGGE RECEIVER B
123	SST 304L			<u> </u>	FROCESS CELL	SLUDGE RECEIVER B
622	551 304L	15.MIDE X 15.57 HIGH X 20.CONB	29606 BAL	<u></u>	PROCESS CELL	SLUBBE RECEIVER B
31 ₆	STAINLESS	HIGH X 20' LONG	10 6PK		PROCESS DELL	DISSOLVER E CONDENSER/DE-ENTRAINER
201	RKSTELLOY C-276			4	PADCESS CELL	DISSOLVER B SANTLE PUNE A
502	RASTELLOY C-276			-	PROCESS EELL	DISSULVER B ABITATOR E
506	HASTELLOY C-276				PROCESS LELL	DIESTAGE E MELLALDE B
24:	HASTELLOY C-276			-	PROCESS CELL	\$1350 <u>77</u> 24 \$ 1650 <u>26</u> 55 FJMP \$
1-3 -ta 17-	HASTELLOY C-276				erocess cerr	DIBSCLASE & JUNEAU & MANELLE
63 (4 (4	HASTELLOT C-276	15 FIDE 1 15.5 HIGH X 27 LONG	42760 BAL		PROCESS CELL	מואבטר עבר פ
1.3 59 54	551.304			<u></u>	PROCESS CELL	STATUL P
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9~ !)	557 7742	15 MINE) 15.5	25000 BAL	 	PROCESS CELL	SCHOOL SECTIONS
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261	HASTELLO: C-275			' 	FROCES CELL	PISSUICE E SHEETE FIFE F
Un International International	HFETELLEY .			<u>-</u>	PROCESS TELL	1 פוואנטר גפר ש 1925 אונטר ב
޶ Or	935TELLOY C-276			 	PRECESE CELL	D1850[VER # #5:1::07 }
24e	HASTELLOY C-276			 	NEGCESS CELL	DISSELVER & TRANSFER PEAR F.
240	HRSTELLOY C-276			\ 	PROCESS CELL	DISSOLVER & TREASPER FORE R
2,135	HASTELLOS C-276	15 WIDE) 15.5 KIGH) 27 LONG	42000 BAL	 - -	55900 CELL	01550_9E &
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No. TORESE (C TORESE & A'D : 20'H, M' BUSSEE CAF TRAISE	PRICES CELL	1.3		HIGH X 20 LONG	STEEL
TRAKEPET PURT &	PROCESS CELL	<u> </u>			
NOX TORES FURF &	PROCESS CELL				
RECOVERED VICTORY	PFOCESS CELL		32000 BAL	IE WIDE X 15.57 HIGH X 22 LONG	STAINLESS
TRANSEER SCHE A	m m m				
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ARECO REC NO THE	PROCESS CELL				
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SURBENATE FEED-FECEIVER A	143) 553,044				
ACTIATOR B	PROCESS CELL				
SHEEFWATE FEEFWEELEIVER B	RECOESE CELL		28000 BAL	15 WIDE) 15.5" HIGH 20"LONE	13315 21914 21914
TRANSPER PURP A	PROCESS CELL				
SUFERNATE FEED RETEIVER E ASITATOR A	EUDIES CELL	 - -	:		
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9 184 <u>년 3도개</u> (313건 4년)	FROCESS CELL	<u> </u> 	199 (1666)	H16H X 27'LONG	STEEL
TRANSPER PUMP A	PROCESS CELL	<u> </u>			
ASITATOR A	1130 5530084	<u> </u>			
W TANT BETT WHITE LYN W	PROCESS CELL	. <u>.</u> 			
LOW LEVEL WASTE TAND B	PROCESS CELL	<u> </u> -	46000 BAL	15 RILE) 15.5 HIBH X 27 LDHG	SIEEL
TRANSFER PUMP A	PROCESS LELL	<u> </u>			
PETRIOR A	PROCESS CELL	<u>ا</u> اب			
THE FUEL WASTE TARK B	PROCESS CELL	<u> </u> -			

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31266					FEEL
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				3737 5530534	NETTE SECENTER
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STEEL PERTECTOR	2 C H	4.000 4.000 4.000 4.000		יייטינים לפנר	SOLVENT STOREE TH COOLING COIL
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			,-	113. 3530543	NET OFFECE SCHUEEET RECVE TANI ABUTATOR A
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± ±	253711525 518117525	4.6"DIA X 5"H	749 005	-	IN BLD6/OUT-OF-CELL	STRIF SOLUTION FEED TANK
				+	IN BLTS/OC)-OF-CELL	SCRUS SOCITION FEET TANK ASTIATOR A
				Н	IN BCDG/031-0F-CELL	SCALR SOCUTION FEED TAIN TRANSFER PUNY A
;;;	SIEEL	4 5 X 310,9 B	7 49 905	ب	IN BLDG/DUY-OF-TELL	SCRUB SOLUTION FEED TAN
39,725	:					TOTAL IN-CELL EQUIPHENT
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i.n	3315 25377758			ક	PFOCESS CELL	144) JE15
10 104 10	SIEEL		1500 SCFR	.	AROTERS CELL	0FF-645 FIL1E4
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16.7	31614-ESE	H. J. Y. J. 9			PROCESS CELL	HAT DEFEST SCRIBER
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			·	H PLOG/OUT-OF-CELL	3.08 SOUTH HYDROYIDE ADDITION THUS - TRANSES PUMP
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SALVES	7 5 10 1 5 H		1	TELLOG/DET-OF-CELL	6.5K SOCIUM HIDROITE ADDITION TANK - ABITATOR A
			-	N BLDG /OUT-DF-CELL	6.5% SOSIUM HIGGOVICE ADDITION TANK - PUMF A
m	F. 5	30v Br.	-	1733-48-16979997 41	ADDITION THAT HYDROTIDE
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]# 8176-051-0F-EELL T	REST SCUTTON FEED TANK
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			· · · · ·	1131-19-191 911-151	BLUGE RETEIVER SOLIUF
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Talli Fee				IN FIDE/DUT-OF-CELL	4 - 1011 - 4 - 1011 - 131 - 144)
				IN RTPP OLL-DE-CELL	
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<u> </u>	TOTAL SEC.	1			
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THANDER FUNE A	- 1132-40-10-1013 H	-			
ELIBRIT ABEL TON TANI	7732-18-16-18-18-41	-			
TOTAL COLD CHEMICAL IN BLUE					
HALL SENIOLS TOP STATE	7737-38-180: 9679-41-138:	45	200 20 5%	0 01 (9,4 51)	Satisfy of the same of the sam
HITTER FILE BIRKEDE TOWN	MOT IN ECDS:				
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18 355-361 5645 B	1133-46-160 19178 HE 128	-			
081 - 13 NOTATIOS 30435	1120-56-0511 101 1N ETER	 	200 58	H31H 4.4.0 X 3.0.	STAINLESS
FRANKE SOLUTION ALP TANK	1150-40-100 100-11-100-0	<u>-</u>		-	
STATE SELVITOR BIT TAND	1153-10-100 1001-101-101-1001-1001-1001-100	<u> </u>			
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TABLE 4-3. INTEGRATED FACLILITY CONSTRUCTION COST ESTIMATE SUMMARY & BASIS

COST CATEGORIES	DIRECT COST X 1,000 (1988 \$)	ESTIMATE BASIS		
Temporary Construction	\$1,000	Allowance of 30% of HWVP temporary construction		
Site Prep	29	i Material take off		
Structures	\$54,269 }	Quantities based on drawing MTO Applied HWVP unit installation rates		
Fire Protection/Detection	\$2,000	Same as stand-alone facility		
HVAC	\$10,475 	Vendor quotes for supply and exhaust fans and HEPA filter plenums Equipment factored ductwork and dampers/diffusers Cooling tower included with utilities Stack included with structure Increased size of sand filter(with structures)		
In-Cell Pipe	\$18,447 \$18,447 	Jumpers - MTO based on equipment count Embeds factored using HWVP data Hot pipe trench MTO		
Electrical Supply	\$0	 		
Electrical Distribution	\$5,720	 Same as stand-alone facility		
Process Utilities	\$9,868	Capacity factored from HWVP		
DCS SYSTEM	\$12,896 }	Equipment factored from PFM Installation factored from HWVP		
HP System	\$7,596	Equipment factored estimate from HWVP		
Communications	\$250	Same as stand-alone facility		
Remote Handling, Sampling, Analytical & Maint Repair	\$20,414 	Equipment factored estimate, see priced equipment list		
Process Equipment:	1			
In-Cell Equipment	Hot pipe trench MTO so Same as stand-alone facility			
Cold Chemical - In Bldg	 \$4,123			
Cold Chemical - Out of Bldg	 \$6,685			
Construction Startup	\$2,083	Factored from HWVP direct construction costs		
Operations Control Building	 \$1,796 	 Factored from HWVP 		
TOTAL DIRECT COST	\$207,943	1		

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FIGURE 4-2
PRE-TREATMENT PLANT SCHEDULE
INTEGRATED (Expanded VITRIFICATION BUILDING)

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	FY 89	FY 90 ;	FY 91	FY	92 ;	FY 93	;	FY 94	1	FY 95	;	FY 96	 	FY 97	; FY 98 ;	FY 99 ¦	FY 00 ¦	FY 01	FY 02	FY 03	; FY 0
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The co-located pre-treatment facility was estimated by combining HWVP with a co-located facility which would utilize existing HWVP services. The direct cost estimate for construction and procurement, including the estimate basis is shown in Table 4-4. Also included is a priced equipment list for the co-located pre-treatment alternative.

2) Co-Located Pre-Treatment Schedule

The schedule for the co-located pre-treatment facility is shown in Figure 4-3. The co-located pre-treatment schedule is very similar to the stand-alone pre-treatment schedule. Therefore, the critical activities flow through the Environmental Impact Statement and RCRA and the pre-treatment pilot plant demonstration for defining the technical data package.

Compared to the stand-alone and integrated pre-treatment alternatives the co-located schedule has a minor impact to the HWVP BA profile, because construction of the co-located facility does not occur until government fiscal year 1997.

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				닉	_ IN BUDG/OUT-OF-CELL	SCRUB SOLUTION FEED TANK
	STATINLESS	4.9.014 X 2.H	500 BAL		IN BLD6/OUT-OF-CELL	SCRUE SOLUTION FEED TANK
39,725				Ì		TOTAL IN-CELL EQUIPHENT
7	STAINLESS STEEL		25 BPK	0	PROCESS CELL	SUMF JETS
. 15	STAINLESS			30	PROCESS CELL	TAN JETS
230	STAINLESS STEEL		1500 SCFH	4	PROCESS CELL	OFF-BAS FILTER
16	STEEL		1500 SCFK		PROCESS CELL	DFF-6A5 HEATER
316	STEEL	3.0 % 7.H	20 GPK		PROCESS CELL	NH3 SCRUBBER CONCENTRATOR
107	STEEL	6.D X 12.H		Н	PROCESS CELL	NHY OFF-BAS SCRUBBEF
514	STEEL STEEL	15 H	70 BPR	니	PROCESS SELL	RHY SCRUBBER SOLUTION
316	STEEL STEEL	2.0 x 6.T			PROCESS CELL	CS CONCENTRATOR CONVENSER
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194	STEEL	ACH X 12'L X S	Jon 200	٠	PROCESS CELL	TRUE) EXTRACTION KODULE EXTRCIN CENTRIFUGAL CONTACTORS
255					PROCESS CELL	NHS SCRUBBER CONDERSATE RECVE ABITATOR A
123				닉	PROCESS CELL	NHT STRUMEER CONDENSATE RECVE TRANSFER PUMP A
65 C	STEEL	10 D X 7 H	4000 BAL 11	,	PROCESS CELL	NHO SCRUBBER CONDENSATE RECVE NHO SCRUB CHUNST REC COOL COIL
× 1000		DIMENSION		YT9	LOCATION O	ITEK

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	1 0 640 7 8 0	000.000	۰-	ינא מרמטיטטייטריר.	TREACHE FAMILY CHRIS
277			,	i i	至
			-	ייי פרייי	ADDITION TANY - TRANSER PUMP A
STEEL	u c x H17.9 t	JRG OOC	1 -	IN BURE/BUT-OF-CELL	3.0M SCILLM HYDROXIDE ADDITION TANY
			-	IN BLD6/OUT-OF-CELL	ADDITION TANK - ABITATOR A
			-	IN BLDG/OUT-OF-CELL	0.5K SODIUM HYDROXIDE ADDITION TANK - PUMF A
STAINLESS	4.9.NIU.9.P	500 GAL	۲	IN BLDG/OUT-OF-CELL	0.5K SODIUK HYDROXIDE ADDITION TANK
			4	IN BLDG/OUT-OF-CELL	O.38 NITKIC ACID ADDITION TANK ABITATOR A
			H	IN BLD6/DUT-DF-CELL	0.3% NITRIC ACID ADDITION TANI TRANSFER PUMP A
STEEL STEEL	4.9.8 X 910.9.1	500 BAL	Н	IN BLDB/OUT-OF-CELL	0.3H HITEIC ACID ADDITION TANK
			닉	IN BLDG/OUT-OF-CELL	C.18 NITEIC ACID ADDITION TANN
			-	IN BLDG FOUT-OF-CELL	O.IM WITEIC ACID ADDITION TAKE TRANSFER PUMF A
STAINLESS	4.9.DIU X 2.H	500 6AL	-	IN BLD5 , OUT-OF-CELL	8.18 RITRIC ACID ADDITION TANK
			-	IN BLD6/DUT-OF-CELL	IX PEGENERATION MAKEUF TANI ABITATOR A
				IN BLD6/DUT-DF-CELL	IX RESERESATION MAXEUP TARK
STEEL	4.6.019.7 2.H	200 BAL	Н	IN BLDG/DUT-DF-CELL	IX REBEMERATION HAVEUR TAHV
			-	IN BUD6/OUT-OF-CELL	SOLVENT MAKEUP TAM)
				IN BLD6/BU1-DF-CELL	SCLVENT MAXEUR TAN) TRANSFER PUMP A
STEEL STEEL	4.6.DI8 X 2.H	500 6HL		IN BLD6/OUT-OF-CELL	SOLVENT MAKEUP TANK
			Н	IN BLDG/OUT-OF-CELL	ARSH SOLUTION FEEL TANK ABITATOR A
			-	IN BLDG/OUT-OF-CELL	WASH SOLUTION FEED TARK TRANSFER PUMP A
STATKLESS STEEL	H.S.Y. BIO.P.P	500 GAL	4	IN BLDG/OUT-DF-CELL	RASH SOLUTION FEED TAN:
			<u>-</u>	IN BLD6/007-OF-CELL	STRIF SOLUTION FEED TANI
				IN BID6/OUT-OF-CELL	STRIF SOLUTION FEED TAN
				<u> </u>	

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FEE-ZOUT FEED TANK TRAKEFER FURF A	IN BLDG/ODY-OF-CELL	4 3	CAPACITY	DINENSION	HATERIAL \$
ERE-COLT FEET TANA	IN 9LD6/QUI-DF-CELL	-			
C ACID ADDITION TANK	IN PLUB (UNI-DE-CELL	<u> </u>	200 BAL	4.9.014 X 2.H	STATINLESS.
126 KITAIC ACID ADDITION TANI TRANSEEF PUME A	IN BLOG/OUT-DF-CELL	<u>.</u>			
IZM NITRIC ACID ADDITION TANN ABITATOP A	IN BLDG/OUT-OF-CELL	닉			
PERO) IDE FEED TAH)	IN BLDG/OUT-DF-CELL	닉	500 BAL	4.9.018 X 2.H	STAINLESS
PERDY IN FEED TAKE	IN BLDG'DUT-DF-CELL	-			
PEFGITE FEED TANK	IN BLDG/DUT-DF-CELL	니			
SLUGSE FECEIVER SODIUK	IN BLDG/OUT-DF-CELL	-	749 00g	4.6.DIY 2.8.H	STEEL
SLUDSE RECEIVER SOLIUK	IN BLDG/DUT-OF-CELL				
SLUDGE FECEIVER SOUTH	IN ALDOVOUT-DF-CELL	-			
LOW LEVEL WASTE YAH! SODIUM	IN BLDG/DUI-DF-CELL	•	500 BAL	4.9.018 X 2.H	STAINLESS STEEL
NITELE ADDITION TANK SOCIUM	IN PLD6/001-0E-CELL	니			
LOW LEVEL WASTE TANK SOCIUM	IN BLDG/OUT-OF-CELL	버			
IX MAKEUP TANI (Cs)	IN BLDG/DUT-OF-CELL	4	200 BAL	H.S. X. VIG. 9.1	STAINLESE
IX HAKEUF TAR) (Cs) TRANSFER PUMF A	IN BLOG/OUT-DF-CELL	거			
ABITATOR A	IN BLDG/OUT-OF-CELL				
DEF-BAS TREATHENT SODIUM	IN BLD6/OUT-OF-CELL		500 GAL	4'6'DIA X 5'H	STAINLESS STEEL
NITRITE TAN - PUMP A	IN BLD6/OUT-DF-CELL	4			
NITRITE TANY - ABITATOR A	IN BLDG/OUT-DF-CELL	4			
OTILITY TARE	IN BLDG/OUT-OF-CELL	Ы	500 GAL	4.9.018 X 2.H	STEEL
UTILITY TAN: TRANSFER PUMP A	IN BLDG/OUT-OF-CELL	,_			
OTILITY TANK ABITATOR A	IN BEDBYOUT-OF-CELL				
IX KOLEUP TAN)	IN BLDG/DUT-DF-CELL	Н	500 BAL	4.6.018 x 2.8	STEEL
D HATELY TAIN.	TH BCD6/001-OF-CELL	P			

				-	NOT IN BLDS/	THP RECEIPT/STORAGE TANK
	STEEL	7'0"5 X 7'0" HIGH	2000 GAE		NST IN BCD6/	TBF RECEIPT/STORABE TANK
				<u></u>	NOT IN BLDG/	NPH RECEIPT/STORAGE TANK TRANSFER PUMP A
	STEEL	7.0.0 X 7.0. H16H	2000 GAL	니	NOT IN BLOG/	NPH RECEIPT/STORAGE TANK
				<u></u>	NOT IN BLDG/	WASH SOLUTION MIX TANN. ABITATOR A
					NOT IN BLOG?	RASH SOLUTION MIX TARK TRANSFER PUMP A
	STAINLESS	7.0 . 0 X 7.0.	2000 GHL	<u></u>	NOT IN BLOG/	WASH SOLUTION HIX TANK
					NOT IN BLDG/	STRIP SOLUTION MIX TANK ASITATOP A
					NOT IN BLOG/ OUT-OF-CELL	STRIP SOLUTION MIX TANK TRANSFER PUMP A
	STRINLESS	7'0°D X 7'0° HIGH	2000 BAL	<u>-</u>	NOT IN BLOG/	STRIP SOLUTION HIT TANK
					OUT-OF-CELL	AGITATOR A AGITATOR A
				4	OUT-DF-CELL	SCFIR SOLUTION KIX THRE
	STEEL STEEL	7.0°B X 7.0°	2000 BAL	4	ROT IN BLD6/ OUT-OF-CELL	SCRUE SOLUTION MIX TAN
				片	NOT IN BLD6/	HYDROGEN PERGXIDE STORAGE TE TRANSFER PUME A
349	ALUKINUK	9.0.0 X 40.10Hg	20000 BAL	Ħ	NOT IN BLDG!	HYDROSEN PEROXIDE STORAGE TO
				બ	NOT IN BLDG/	SODIUM HYDROJIDE STAG TANE TRANSFER PUKP A
121	CARBON	15.0°D X 15.6°	20000 GAL	બ	NOT IN BLDG/	SODIUM HYDROXIDE STURAGE TANI
				-	NOT IN BLOG/	NITFIC ACID STORAGE TANK TRANSFER PUKE A
345	STEEL	HBIH 19.0°D X 15.9°	20000 6AL		NOT IN BLD6/	NITKIC ACID STORAGE TAN)
494						TOTAL COLD CHEMICAL IN BLDG
				4	IN 9106/007-DF-CELL	ELUANT AEDITION TANK
				닉	IN ECD670UT-DF-CELL	ELVANT ADDITION TANK
	STAINLESS	4.6.DIU X 2.H	500 BAL		IN BLD6:001-0=-CELL	ברחיאר אומונוסא נאוא
				t	IN BEDRAOUT-DE-CELL	TY MATEUR TANK
3			_	_	-	

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164				<u> </u> =	MOM REPAIR	KSK REPAIR EQUIPMENT
178				<u> </u> =	NDN-REG SHOP	NON-REG HAINTENANCE EGUIPKENT
568				====	REG KAJNI SHOP	KEG MAINTENANCE EDUIPHENT
1,210						TOTAL COLD CHEMICAL OUT OF BLDS
				1	NOT IN BLDG/ OUT-OF-CELL	FRECORT RIX TANK ASITATOF A
				<u> </u> -	NOT IN BLIG!	FRECCAI MIX TANK TRANSFER PUMP A
18	STATINLESS	H16H H16H	500 GAL	 - -	OUT-OF-CELL	PRECOAT MIX TANN
				 -	NOT IN BLDG	SODIUM NITRITE MIX TANK ABITATUR A
					ONI-OE-CELL	SODIUM NITRITE HID TAND TRANSFER PUMP A
}	SIEEL	4.9.D X 2.0.	159 /05	 ,_	NOT IN BLDG	SOFIUM NITRITE HIX TANI
				 	NOT IN BLOCK	SOCIUM HYDROXIDE DILUTION TAPE ASITATOM A
				\ 	NOT IN BLDG:	SODIUM HYDEOXIDE DILUTION TAKK! TRANSFER PUMP A
700	STEEL	H91H 5.9.5 X 2.0.	390 GAL	 	NOT IN BLUE?	SODIUM KYDROXIDE DILUTION TANK
			•	<u>-</u>	ADT JN BLDG'	RITRIC ACID DILUTION TAN: ABITATOF A
				ا	OUT-DE-CELL	RITRIC ACID DILUTION TARV TRANSFER PUMP A
150	STEEL	4.5.b X 2.0.	- 500 GAL	W	NOT TH PLDG	RITRIC ACID DILUTION TANK
					NOT IN BLOG/	SOLVERT MIX TAKE. ACITATOR A
				,_ 	NOT IN BLDS/	SOLVENT HI) TAN) TRANSFER PUMP A
	STAINLESS	HIGH X 5 (7	500 BAL	<u> </u> 	NOT IN BLDG/	SOLVENT MIX TANK
-2				<u>-</u>	NOT IN BLUG.	PRITATOR A
				<u> </u>	NOT IN BLDG/	TRANSFER FUNE &
to	STEEL	H91H 4 6 0 1 5 6.	500 BH	-	NOT IN ELEGA	CHEC XIX TANK
	,			• - :		

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9,837						TOTAL REMOTE HANDLING EQUIPMENT
31	STAINLESS			-	FECA	FECA REMOTE LIGHTS
1,122				9	CUI-UP KOON	CUT-UP ROOH EQUIPMENT
263	STAINLESS		30 TDN	9	CANYON	CRANE BLOCKS, YOKES, & BAILS
6- 60 54	STEEL			ĺ	CHA	CKY SHIETD DOOK/HOISI
1,218	CARBON		7.5 TON	4	COKC	COKC CRANE
166	CARBON STEEL			4	MAINI AREA	SHIELD WINDOW CART
73	CARBON		SINGLE	식	HSK REPAIK	NSK CARTS
2,165	STEEL		PAR 3000	식	REMOTE MAIN CELLS	ELECT MECH MANIPULATOPS
1,768	STEEL		HODEL F	ន	VARIOUS REMOTE CELLS	HASTEP SLAVE HANIPULATORS
774	CEAD BLASS			뉨	SAKPLE REKOTE CELLS	28. BHIELD MINIONS
789	LEAD BLASS			Ы	RAINT. REMOTE CELLS	SHIELD MINDONS
, B.	STEEL	75' ¥ 11 ¥ 20	30 TON	- -	CANYOH/OUT-OF-CELL	CRATE
1,911	-					TOTAL ANALYTICAL FACILITIES
103					בפרה ראצ	COLD LAE EQUIPHENT
1,808	STEEL			10.1	HOT LAE	HOT LAE EQUIPMENT
2,893						TOTAL PROCESS SAMPLING
2,205	STEEL		15 11.	35	SAMPLE CELLS	SAMPLE MODULES
989	STAINLESS	2. X 2. X 2.			SAMPLE/ANALYT ROOM	TRANSFER DRAWERS
1,779					MAINTENANCE	TOTAL EQUIPMENT DECON REPAIR &
ć.				3		CHY DECON EQUIPHENT
76	STAINLESS STEEL			-	HSM REPAIR	DECON BLOVE BOX
1,648	STEEL	2ª		-	ANALYTICAL CELLS	PREUMATIC TRANSFER SYSTEM
					1	****

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	DIRECT COST	!
COST CATEGORIES	(X 1,000 (1988 \$)	ESTIMATE BASIS
Temporary Construction	\$1,000	Allowance of 30% of HWVP temporary construction
Site Prep	 79	 Material take off
Structures	! \$59,645 !	 Quantities based on drawing MTO Applied HWVP unit installation rates
Fire Protection/Detection	\$2,000	Same as stand-alone facility
HVAČ	\$11,868 	Used stand-alone supply/exhaust system Equipment factored ductwork and dampers/diffusers Cooling tower included with utilities Stack included with structure Increased size of sand filter(with structures)
In-Cell Pipe	{ \$14,888 	 Same as stand-alone facility
Electrical Supply	 \$184	Capacity factored from HWVP
Electrical Distribution	\$5,720	Same as stand-alone facility
Process Utilities	\$13,351	Capacity factored from HWVP
DCS System	\$12,896 	Equipment factored from PFM Installation factored from HWVP
HP System	\$9,148	
Communications	\$250	Same as stand-alone facility
Remote Handling, Sampling, Analytical & Maint Repair	[\$21,352 	 Same as stand-alone facility
Process Equipment:	1	
In-Gell Equipment	\$50,292	Same as stand-alone facility
Cold Chemical - In Bldg	\$4,123	 Same as stand-alone facility
Cold Chemical - Out of Bldg	\$6,685	
Construction Startup	\$2,160	Factored from HWVP direct construction costs
Operations Control Building	\$0	
TOTAL DIRECT COST	\$215,641	

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FIGURE 4:3 PRE-TREATMENT PLANT SCHEDULE CO-LOCATED

	CO-LOCATED	
	CY 89 CY 90 CY 91 CY 92 CY 93 CY 94 CY 95 CY 96 CY 97 CY 98 CY 99 CY 00 CY 01 CY 02	CY 03 ; CY 0
·	FY 89 : FY 90 FY 91 ; FY 92 ; FY 93 ; FY 94 ; FY 95 ; FY 96 ; FY 97 ; FY 98 ; FY 99 ; FY 00 ; FY 01 ; FY 02 ; FY	03 FY 04
MILESTONES	Concept flw Diagr/Equip List . Project Validated . PSAR Apprvd	
	Concept Design Complete . Proj Mgmt Plan Apprvd	•
		•
	Prelim Economics 4	•
		•
REGULATORY COMPLIANCE	. EIS .RCRA Part B . PSAR	•
		•
PRE-TREATMENT PLANT	Plot Rearrgmt/Redesign HWVP	
		•
	Prolim Design HWVP	•
	Detailed Design HNVP	•
	Construction HWVP	•
		•
	Stdy of Alternatives	•
	Conceptual	•
	Design Validation Preliminary Design	•
	ት ላ . Advanced Conceptual ላ ላ ነ	·
	to Support EIS/RCRA Detailed Design	•
	Prelim : Prelim Drft Final Apprvd	
	Data Sht Final Tech Pkg Tech Pkg	•
		•
	Site Prep	
TECHNOLOGY	Short Form Data Sheets . Technology Package B & A 🐈 🐈 Construction Pre-Treatment .	•
		d Testing



4.5.2 Co-Located Pre-treatment Schedule

The schedule for the co-located pre-treatment facility is shown in Figure 4-3. The co-located pre-treatment schedule is similar to the stand-alone pre-treatment schedule. Therefore, the critical activities flow through the Environmental Impact Statement and RCRA and the pre-treatment pilot plant demonstration for defining the technical data package.

The budget authorization (BA) profile for the Co-located pre-treatment facility is similar to the stand-alone pre-treatment BA profile.

4.6 Contingency Analysis

The contingency analysis for construction costs was based on an assessment of the estimating information and completeness of data for each system. The contingency for Detailed Design, Field Engineering and Inspection, Engineering Management, Construction Management, and Project Management was assumed to be 30% for this estimate.

5.0 Life Cycle Cost Estimation

5.1 Introduction

Life Cycle Cost (LCC) analyses have been performed in accordance with the methodology provided in Subpart A of 10 CFR Part 436 and in NBS Handbook 135 (Rev.),

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"Life Cycle Costing Manual for the Federal Energy Management Program."

Based on the three options for equipment and facility design, a life cycle cost was developed assuming a 20 year operation (commensurate with concurrent decommissioning with HWVP). The life cycle costs were based on the following elements:

Estimated Actual Construction Cost

Operating personnel requirements, including:

Management and administrative personnel
Operating personnel
Maintenance personnel
Operating Contractor Support Personnel
Laboratory Personnel

Maintenance Materials

Utility Requirements, including:
Electricity Service
Steam Service

Consumable Chemicals and Catalysts

Decommissioning

Fixed Operational Cost Assessments

5.2 Assumptions and Sources of Data

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The estimated actual construction cost estimate was taken from the Fluor construction cost estimate, considering contingency, but not escalation, in accordance with the guidelines given in NBS Handbook 135 (Rev.).

Decommissioning costs were considered as a negative net salvage value for the plant, occurring in the year following the last year of operation of HWVP. These costs were set at ten percent of the estimated total construction cost.

Operating and maintenance personnel requirements were factored from HWVP staffing requirements given in the HWVP Technical Data Package (SD-HWV-DP-001) for operation, maintenance, and management and support personnel requirements, with HWVP estimates for laboratory personnel and Operating Contractor support personnel (Total plant staff of 250). The stand alone pre-treatment plant staffing (250) was assumed to be 75% of HWVP plant staffing (290) and the co-located and integrated facility staffing was reduced by 35 individuals to account for shared management, administrative, and maintenance service personnel.

Maintenance material costs were estimated to be four percent of installed equipment capital costs per year, based on the material component of maintenance being equal to approximately one-half of the estimated maintenance costs. (Total maintenance is estimated at eight percent of installed equipment capital costs per year, per Perry's Chemical Engineers Handbook, but the labor component is factored into the plant population.)

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Utility requirements were estimated as follows:

Steam service was based on the use of an electric boiler for process steam, in accordance with Hanford current objectives for "zero discharge" of wastes. Process steam is required for 50 percent of annual time based on an assumed 50 percent availability factor assumed. Operating steam loads were assumed to be 2/3 of total design steam load, commensurate with anticipated parallel and batch processing operation.

Electrical service was based on normal operation for HVAC and HVAC header and chiller equipment, adjusted for seasonal variations in load. Process electrical loads were based on an operating time of 50 percent per year. Lighting loads were based on a uniform lighting of 2 watts per square foot.

Consumable chemicals and catalysts include the estimated annual consumption of chemicals for two ten-year campaigns, with the NCAW, NCRW, CC and PFP wastes being processed over the first 10 years, and the SST waste processed over the second 10 years.

In the Life Cycle Cost analysis, radwaste costs were assumed to be zero for all alternatives, since the radwastes produced by all alternatives will be returned to the tank farms for final disposal as Low Level Waste. The cost and schedule for this radwaste disposition is not considered part of the pretreatment LCC.

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Fixed Operational Cost Assessments for research and engineering technology, service contracts, rail service, laundry, waste disposal, and phone service, etc., were factored from HWVP estimates for similar assessments, and were fixed at \$1,000,000 per year before contingency.

All of the above operating costs were increased by a 20 percent contingency factor in the LCC estimate.

5.3 Life Cycle Cost Worksheets

The attached pages provide LCC Worksheets prepared for the three pre-treatment facility concepts. These worksheets include the project description, components of life cycle costs, schedules for escalation adjusted uniform present worth factors for all LCC components, and completed LCC Worksheets for Energy, O&M Costs, and for calculating the Total Life Cycle Cost (TLCC).

6.0 Recommendations of Areas for Further Study

During the evaluation of the three pre-treatment alternatives, several areas surfaced that Fluor Daniel feels warrant further study. The recommendations for further study are noted below:

6.1 The estimates were prepared without the benefit of process flow diagrams, Functional Design Criteria, and Technical Data Package, which could significantly affect the ultimate facility cost. It is recommended that process flow diagrams and accompanying criteria/data packages be developed to support a higher level of confidence in the estimated TEC.

NEW BUILDING DESIGN LCC WORKSHEETS

I. PROJECT DESCRIPTION

AGENCY: Department of Energy

ADDRESS: STREET

CITY/COURTY Hanford STATE Washington

DoE REGION

PROJECT CONTACT PERSON:

POSISTION TELEPHONE

EULLDING OR FACILITY DESCRIPTION: INDUSTRIAL FACILITY - STAND ALONE PRETREATMENT FACILITY

CLASSIFICATION FOR ENERGY CHARGES: Industrial

PROJECT DESCRIPTION: High Level waste processing facility including buildings, installation of all

equipment, offsites and engineering

EXPECTED BUILDING OR SYSTEM LIFE: 40 years or greater

ESTIMATED BUILDING OR SYSTEM INVESTMENT COST: \$460,000,000 Pretreatment Plant (total installed cost) \$0 HWVP Additions (total installed cost)

ENERGY INFORMATION:

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act: year

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Energy Type: Electricity 222222222222222222222

Annual Quantity

Price Unit

3.60E+07 kmh

\$0.0294 per kwh

Energy Type: Steam

Annual Quantity

Price Unit

9.980E+07 1b

\$9.50 per 1000 lb

PERIOD OF STUDY:

2003 (start-up) To

2022 (end year)

NO OF YRS COVERED:

20 ----- BASE YEAR:

1988 ======

DISCOUNT RATE:

10%

========

Calculating the Presen	t Value of Energy	Costs			
Туре		Base-Year Energy Price	: Base-Year	(4) Escal. Adjusted Present Worth Factor	Present Value
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(}	(per kwh)	;	1 1 1	
Electricity - kwh	3.60E+07	\$0.0294	\$1,058,000 ;	; 2.7810 ; ;	\$2,942,000
		Base Charge	1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		 Decand 	; ; ;		
		Time of Day	 	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		Capacity	:		***************************************
		: : :Other :	! ! !		
Steam - 1bs	9.980E+07	(per 1000 lb)		2.7810	\$2,636,00
TOTAL	XXXX	; xxxx	; xxxx	: xxxx :	\$5,578,00
Calculating Investment					T
(1) PV Estimated Actu	al Investment Cos		Building Design	nn teent Plant	\$177,928,00
(2) Investment Cost A	Adjustment Factor			,	t
(3) Adjusted Investme					\$177,928,00

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NEW BUILDING DESIGN LCC WORKSHEETS (Continued)

C. Calculating the Annually Recurring (Nonfuel) Operation and Maintenance (D&M) Costs

Itea :	Amount of Annually	(2) Modified UPW Factor	(3) Present Value of Annually Recurring Costs
Normal Maintenance Materials	8,640,000	2.2419	\$19,370,000
Operating & Maintenance Labor	18,260,000	2.2419	\$40,937,000
Consum Chem Usage - 1st 10 yr	2,640,000	1.6181	\$4,272,000
Consum Chem Usage - 2nd 16 yr	1,750,000	0.6238	\$1,092,000
Radwaste Disposal Costs	0	2.2419	\$0
Fixed Operational Cost Assessments	1,200,000	2.2419	\$2,590,000
TOTAL	XXXX	; ; ;	\$68,361,000

. Calculating	Nonannually Recurring (Nonfu	el) O&M Costs, Re	palcement Co	sts, and Salvage	Value	
(1) Year in Which Expenditure to Occur	; (2) ; (3) Amount of Non: Amount of Annually Replacement Recurring D&M Cost (Base Year \$) (Base Year \$	(Base Year \$);		(6) PV of Non- Annually Recurring D&M	(7) PV of Replacement	: (8) ; PV of ; Salvage ; Value
2023	Decontamination & Decommissioning	(46,000,000)	0.0356	 		; ;(1,636,869 ;
				1 1 1 1 1 1 1		! ! ! ! !
TOTAL	; xxxx ; xxxx	: xxxx ;	xxxx	t † † 		; [(1,637,000
. Calculating t	he TLCC					
	(1) Present Value Energy	Costs			\$5,578,000	
	(2) Present Value Adjuste	d Investment Cost	5		\$177,928,000	
	(3) Present Value of Annu	ally Recurring (N	onfuel) D&M	Costs	\$68,361,000	
	(4) Present Value of Nona	nnually Recurring	(Nonfuel) 0	&M Costs ·	\$0	
	(5) Present Value of Repl	acement Costs			\$0	•
	(6) Present Value of Salv	age			(\$1,637,000)	
	(7) TLCC of the New Build	ing or System Des	ign	1	= \$253,504,000	

Component :	Estimate Year	*		Constant Dollar Base Year Estimate Escalation Rate Constant Dollars						
1		! !	!	:	! !					
Equiv. Total Installed Cost	1000	Lump Sum	: \$460,000,000	i .	460,000,000					
Pretreatment Plant HWYF Additions		Lump Sum	; 0	0	0					
Salvage Value(Decommissioning)	1988	l Lump Sum	(46,000,000)	0	(46,000,000)					
Normal Maintenance Materials	1988	i Annual	8,640,000	0	B,640,000					
Operating & Haint, Labor(*)	1988	: : Annual	18,260,000	0	18,260,000					
Elect. Energy Usage Costs(\$)	1988	Annual	1,058,400	Per Sched. A	1,058,400					
Steas Usage(*)	1989	: Annual	948,100	: !Per Sched. A : (elec boiler)	94B,100					
Consu≰ Chem Usage 1st 10 yr(‡)	1988	LeunnA	2,640,000		2,640,000					
Consum Chem Usage 2nd 10 yr(\$)!	1988	i Annual	1,750,000	0	1,750,000					
Radwaste Disposal Costs(*)	1988	Annual	0	0	0					
Fixed Oper. Cost Assess'ts(1)	1988	: ! Annual	1,200,000	. 0	1,200,000					

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SCHEDULE A ADJUSTED UNIFORM PRESENT WORTH FACTOR FOR INDUSTRIAL ELECTRICITY

(Ref: WHC & Table Cb-10, Region 10, NBS Publication 709)

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SCHEDULE B

ESCALATION ADJUSTED UNIFORM PRESENT WOPTH FACTOR
FOR COAL FUELED INDUSTRIAL ENERGY

(Ref: Table Cb-10, Region 10, NBS Publication 709)

Year	; Rate ;	Factor	;PV € 10%	; Mod FV	¦ UP¥
1988	5.00%;	1.0000	1.0000	1.0000	1.0000
1989	-0.85%;	0.9915	: 0.9091	0.9014	1.9014
1990	2.10%	1.0123	0.8264	: 0.8366	2.7380
1991	2.10%	1.0336	; .0.7513	. 0.7765	5 3.5145
1992	2.10%	1.0553	1 0.6830	: 0.7208	4.2353
1993			0.6209		4.9043
1994	2.10%;		•		
1995	1.60%		-	-	6.0988
199£	1.50%	1.1356	0.4665	0.5297	6.6286
1997	1.60%;	1.1537	1 0.4241	0.4893	7.1179
1998	1.60%	1.1722	; 0.3B55	0.4519	7.5698
1999	1.60%	1.1909	: 0.3505	0.4174	7.9872
2000	0.98%	1.2026	0.3184	0.3832	B.3704
2001	0.98%	1.2144	0.2897	0.3518	8.7222
2002	0.981	1.2263	0.2633		
2003			•		-
2004	0.98%	1.2505	: 0.2176		. 9.6137
2005					9.8605
2006					10.0844
2007					10.2B75
2008	-0.22%				10.4718
2009			•	•	10.6389
2010	-				10.7908
2011		1.2368			10.9290
2012		1.2368	-		11.0545
2013		1.2368		•	11.1697
2014					11.2724
2015					11.3668
2016		1.2368			11.4525
2017	· ·	1.2368	-		11.5305
2018			-		11.6014
2019		1.2368	: 0.0521	•	11.6658
2020	•		-	-	11.7244
2021			-	•	11.7776
2022	-	1.2368			11.8261
2023		1.236B	-		11.8701
2024					11.9101
2025	0.00%;	1.2368	1 0.0294	0.0364	11.9464

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SCHEDULE C
ESCALATION ADJUSTED UNIFORM PRESENT WORTH FACTOR
FOR 50% SCHEDULE C & 50% ZERO ESCALATION
(End of Year Payments)

er:

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SCHEDULE D
ADJUSTED UNIFORM PRESENT WORTH FACTOR
FOR NO ESCALATION
(End of Year Payments)

2009 0.35% 1.1124 0.135 2010 0.35% 1.1163 0.122 2011 0.35% 1.1202 0.115 2012 0.35% 1.1202 0.115 2013 0.35% 1.1241 0.105 2014 0.35% 1.1320 0.085 2015 0.35% 1.1359 0.076 2016 0.35% 1.1399 0.065 2017 0.35% 1.1479 0.065 2018 0.35% 1.1479 0.055 2019 0.35% 1.1519 0.055 2020 0.35% 1.1560 0.047 2021 0.35% 1.1641 0.035 2022 0.35% 1.1641 0.035			, ,					
1990 0.58% 1.0058 0.826 1991 0.72% 1.0130 0.755 1992 0.72% 1.0202 0.685 1993 0.72% 1.0275 0.626 1994 0.72% 1.0349 0.564 1995 0.72% 1.0423 0.513 1996 0.64% 1.0423 0.513 1996 0.64% 1.0556 0.426 1997 0.64% 1.0556 0.426 1998 0.64% 1.0623 0.368 1997 0.64% 1.0690 0.356 2000 0.64% 1.0690 0.356 2000 0.64% 1.0842 0.265 2001 0.39% 1.0800 0.289 2002 0.39% 1.0842 0.265 2003 0.39% 1.0842 0.233 2004 0.39% 1.0927 0.217 2005 0.39% 1.0969 0.197 2006 0.35% 1.1068 0.176 2007 0.35% 1.1068 0.176 2008 0.35% 1.1085 0.148 2009 0.35% 1.1124 0.133 2010 0.35% 1.1241 0.103 2011 0.35% 1.1202 0.113 2012 0.35% 1.1202 0.083 2014 0.35% 1.1202 0.083 2015 0.35% 1.1359 0.065 2016 0.35% 1.1359 0.065 2017 0.35% 1.1359 0.065 2018 0.35% 1.1379 0.065 2019 0.35% 1.1479 0.057 2019 0.35% 1.1519 0.065 2021 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2021 0.35% 1.1641 0.038	; Mod PV	; UPW ;	Year		Factor	PV € 10% ;	Hod PV (UPW
1991 0.72% 1.0130 0.75% 1992 0.72% 1.0202 0.68% 1993 0.72% 1.0275 0.626 1994 0.72% 1.0349 0.564 1995 0.72% 1.0423 0.513 1996 0.64% 1.0489 0.466 1997 0.64% 1.0556 0.424 1.0556 0.424 1.0556 0.424 1.0690 0.356 1999 0.64% 1.0690 0.356 1999 0.64% 1.0690 0.356 1999 0.64% 1.0690 0.289 1.0800 0.289 1.0800 0.289 1.0800 0.289 1.0800 0.289 1.0800 0.280 0.35% 1.1085 0.1400 0.160 0.260 0.35% 1.11085 0.1400 0.160 0.260 0.35% 1.11085 0.1400 0.160 0.200 0.35% 1.1200 0.1110 0.35% 1.1200 0.080 0.200 0.35% 1.1200 0.080 0.200 0.35% 1.1359 0.060 0.200 0.35% 1.1479 0.065 0.35% 1.1500 0.045 0.050 0.35% 1.1500 0.045 0.202 0.35% 1.1500 0.045 0.202 0.35% 1.1500 0.045 0.202 0.35% 1.1641 0.035 0.050 0.050 0.050 0.050 0.35% 1.1500 0.045 0.022 0.35% 1.1641 0.035 0.050	0.9091		1989	0.00%;		0.9091;	0.9091;	0.909
1992 0.72% 1.0202 0.68% 1993 0.72% 1.0275 0.62% 1994 0.72% 1.0349 0.564 1995 0.64% 1.0423 0.513 1996 0.64% 1.0489 0.466 1997 0.64% 1.0556 0.424 1998 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.36% 1999 0.64% 1.0690 0.356 2000 0.64% 1.0690 0.356 2001 0.39% 1.0800 0.285 2002 0.39% 1.0842 0.265 2003 0.39% 1.0842 0.265 2003 0.39% 1.0984 0.23% 2004 0.39% 1.0984 0.23% 2004 0.39% 1.0969 0.19% 2006 0.35% 1.1008 0.175 2006 0.35% 1.1008 0.175 2007 0.35% 1.1085 0.146 2008 0.35% 1.1085 0.146 2008 0.35% 1.1124 0.13% 2010 0.35% 1.1124 0.13% 2011 0.35% 1.1220 0.111 2012 0.35% 1.1280 0.092 2014 0.35% 1.1280 0.092 2014 0.35% 1.1359 0.065 2016 0.35% 1.1359 0.065 2017 0.35% 1.1479 0.065 2017 0.35% 1.1500 0.047 2019 0.35% 1.1500 0.065 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2022 0.35% 1.1641 0.038					1.0000	0.8264	0.8264	1.735
1993 0.72% 1.0275 0.62% 1994 0.72% 1.0349 0.564 1995 0.72% 1.0423 0.513 1996 0.64% 1.0489 0.466 1997 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.383 1999 0.64% 1.0690 0.356 2000 0.64% 1.0758 0.318 2001 0.392 1.0800 0.285 2002 0.392 1.0842 0.265 2003 0.392 1.0842 0.235 2004 0.392 1.0842 0.235 2005 0.392 1.0969 0.192 2006 0.352 1.0969 0.192 2007 0.352 1.1086 0.172 2007 0.352 1.1085 0.146 2008 0.352 1.1085 0.146 2009 0.352 1.1163 0.122 2010 0.352 1.1163 0.122 2011 0.352 1.124	0.7611	2.5014			1.0000	: 0.7513 ;	0.7513 ;	2.48
1994 0.72x 1.0349 0.564 1995 0.72x 1.0423 0.513 1996 0.64x 1.0489 0.466 1997 0.64x 1.0556 0.424 1998 0.64x 1.0623 0.383 1999 0.64x 1.0690 0.356 2000 0.64x 1.0758 0.318 2001 0.39x 1.0800 0.283 2002 0.39x 1.0842 0.263 2003 0.39x 1.0884 0.233 2004 0.39x 1.0927 0.217 2005 0.39x 1.0969 0.193 2006 0.35x 1.1008 0.173 2007 0.35x 1.1085 0.146 2008 0.35x 1.1124 0.133 2009 0.35x 1.1124 0.133 2010 0.35x 1.1124 0.133 2011 0.35x 1.1202 0.111 2012 0.35x 1.1280 0.092 2013 0.35x 1.1280 0.093 2014 0.35x 1.1359 0.063 2015 0.35x 1.1379 0.065 2016 0.35x 1.1379 0.065 2017 0.35x 1.1519 0.053 2018 0.35x 1.1500 0.047 2020 0.35x 1.1500 0.043 2021 0.35x 1.1600 0.043 2022 0.35x 1.1641 0.033	. 0.6968	3.1982	1992	0.00%;	1.0000	: 0.6830 ;	0.6830 ;	3.16
1995 0.72% 1.0423 0.513 1996 0.64% 1.0489 0.466 1997 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.383 1999 0.64% 1.0690 0.356 2000 0.64% 1.0758 0.318 2001 0.39% 1.0800 0.283 2002 0.39% 1.0842 0.263 2003 0.39% 1.0884 0.233 2004 0.39% 1.0927 0.217 2005 0.39% 1.0969 0.197 2006 0.35% 1.1098 0.197 2007 0.35% 1.1008 0.179 2007 0.35% 1.1046 0.165 2008 0.35% 1.1085 0.146 2009 0.35% 1.1163 0.122 2010 0.35% 1.1163 0.122 2011 0.35% 1.124 0.10 2012 0.35% 1.1220 0.111 2013 0.35% 1.1280 <	: 0.6380	3.8363	1993	0.00%	1.0000	1 0.6209 1	0.6209 ;	3.79
1996 0.64% 1.0489 0.468 1997 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.368 1999 0.64% 1.0690 0.356 2000 0.64% 1.0758 0.318 2001 0.39% 1.0800 0.285 2002 0.39% 1.0842 0.263 2003 0.39% 1.0884 0.235 2004 0.39% 1.0927 0.217 2005 0.39% 1.0969 0.197 2006 0.35% 1.1008 0.175 2007 0.35% 1.1046 0.165 2008 0.35% 1.1085 0.148 2009 0.35% 1.1163 0.122 2010 0.35% 1.124 0.133 2011 0.35% 1.1202 0.111 2012 0.35% 1.1280 0.097 2013 0.35% 1.1280 0.097 2014 0.35% 1.1359 0.068 2015 0.35% 1.1359 0.069 2016 0.35% 1.1479 0.065 2017 0.35% 1.1519 0.052 2018 0.35% 1.1500 0.047 2020 0.35% 1.1500 0.047 2021 0.35% 1.1500 0.047 2022 0.35% 1.1641 0.036	; 0.5B42	4.4204	1994	0.00%;	1.0000	1 0.5645 ;	0.5645 ;	4.35
1997 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.368 1999 0.64% 1.0690 0.356 2000 0.64% 1.0758 0.318 2001 0.39% 1.0800 0.285 2002 0.39% 1.0842 0.265 2003 0.39% 1.0824 0.235 2004 0.39% 1.0927 0.215 2005 0.39% 1.0969 0.197 2006 0.35% 1.1008 0.174 2007 0.35% 1.1008 0.175 2008 0.35% 1.1046 0.165 2009 0.35% 1.1046 0.165 2009 0.35% 1.1124 0.135 2010 0.35% 1.124 0.135 2011 0.35% 1.1202 0.115 2012 0.35% 1.1241 0.105 2013 0.35% 1.1241 0.105 2014 0.35% 1.1280 0.097 2015 0.35% 1.1359 0.076 2016 0.35% 1.1359 0.065 2017 0.35% 1.1379 0.065 2018 0.35% 1.1519 0.057 2019 0.35% 1.1519 0.057 2019 0.35% 1.1519 0.057 2020 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2022 0.35% 1.1641 0.035	; 0.5349	4.9553	; 1995	0.00%;	1.0000	0.5132 ;	0.5132 ;	4.86
1997 0.64% 1.0556 0.424 1998 0.64% 1.0623 0.368 1999 0.64% 1.0690 0.356 2000 0.64% 1.0758 0.318 2001 0.39% 1.0800 0.285 2002 0.39% 1.0842 0.265 2003 0.39% 1.0824 0.235 2004 0.39% 1.0927 0.215 2005 0.39% 1.0969 0.197 2006 0.35% 1.1008 0.174 2007 0.35% 1.1008 0.175 2008 0.35% 1.1046 0.165 2009 0.35% 1.1046 0.165 2009 0.35% 1.1124 0.135 2010 0.35% 1.124 0.135 2011 0.35% 1.1202 0.115 2012 0.35% 1.1241 0.105 2013 0.35% 1.1241 0.105 2014 0.35% 1.1280 0.097 2015 0.35% 1.1359 0.076 2016 0.35% 1.1359 0.065 2017 0.35% 1.1379 0.065 2018 0.35% 1.1519 0.057 2019 0.35% 1.1519 0.057 2019 0.35% 1.1519 0.057 2020 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2022 0.35% 1.1641 0.035	. 0.4893	5.4446	1996	0.00%;	1.0000	0.4665	0.4665 ;	5.33
1998 0.64% 1.0623 0.388 1999 0.64% 1.0690 0.350 2000 0.64% 1.0758 0.318 2001 0.39% 1.0800 0.289 2002 0.39% 1.0842 0.263 2003 0.39% 1.0842 0.263 2004 0.39% 1.0927 0.217 2005 0.39% 1.0969 0.197 2006 0.35% 1.1008 0.179 2006 0.35% 1.1008 0.179 2007 0.35% 1.1046 0.165 2007 0.35% 1.1046 0.165 2009 0.35% 1.1124 0.138 2010 0.35% 1.1124 0.138 2010 0.35% 1.1124 0.138 2011 0.35% 1.1241 0.109 2012 0.35% 1.1241 0.109 2013 0.35% 1.1241 0.109 2014 0.35% 1.1359 0.09% 2015 0.35% 1.1359 0.068 2015 0.35% 1.1399 0.068 2016 0.35% 1.1479 0.068 2017 0.35% 1.1479 0.068 2018 0.35% 1.1519 0.068 2019 0.35% 1.1519 0.068 2021 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2021 0.35% 1.1560 0.047 2022 0.35% 1.1641 0.338				0.00%		0.0000	0.0000 ;	5.33
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2009 0.35% 1.1124 0.135 2010 0.35% 1.1163 0.122 2011 0.35% 1.1202 0.115 2012 0.35% 1.1241 0.105 2013 0.35% 1.1280 0.099 2014 0.35% 1.1320 0.085 2015 0.35% 1.1359 0.076 2016 0.35% 1.1359 0.065 2017 0.35% 1.1479 0.065 2018 0.35% 1.1479 0.055 2019 0.35% 1.1519 0.059 2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.045 2022 0.35% 1.1641 0.035		8.8763	. 2008	0.00%				8.08
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2011 0.35% 1.1202 0.113 2012 0.35% 1.1241 0.103 2013 0.35% 1.1280 0.093 2014 0.35% 1.1320 0.083 2015 0.35% 1.1359 0.076 2016 0.35% 1.1359 0.065 2017 0.35% 1.1439 0.065 2018 0.35% 1.1519 0.053 2019 0.35% 1.1519 0.053 2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.043 2022 0.35% 1.1641 0.033			2010	0.00%				8.34
2012 ; 0.35%; 1.1241 ; 0.103 2013 ; 0.35%; 1.1280 ; 0.093 2014 ; 0.35%; 1.1320 ; 0.083 2015 ; 0.35%; 1.1359 ; 0.076 2016 ; 0.35%; 1.1359 ; 0.065 2017 ; 0.35%; 1.1439 ; 0.065 2018 ; 0.35%; 1.1479 ; 0.055 2019 ; 0.35%; 1.1519 ; 0.055 2020 ; 0.35%; 1.1560 ; 0.047 2021 ; 0.35%; 1.1600 ; 0.043 2022 ; 0.35%; 1.1641 ; 0.033							0.1117 }	
2013 : 0.35%: 1.1280 : 0.09% 2014 : 0.35%: 1.1320 : 0.08% 2015 : 0.35%: 1.1359 : 0.07% 2016 : 0.35%: 1.1359 : 0.06% 2017 : 0.35%: 1.1439 : 0.06% 2018 : 0.35%: 1.1479 : 0.05% 2019 : 0.35%: 1.1519 : 0.05% 2020 : 0.35%: 1.1560 : 0.04% 2021 : 0.35%: 1.1641 : 0.03% 2022 : 0.35%: 1.1641 : 0.03%								8.56
2014 : 0.35%: 1.1320 : 0.083 2015 : 0.35%: 1.1359 : 0.078 2016 : 0.35%: 1.1399 : 0.065 2017 : 0.35%: 1.1439 : 0.063 2018 : 0.35%: 1.1479 : 0.057 2019 : 0.35%: 1.1519 : 0.057 2020 : 0.35%: 1.1560 : 0.047 2021 : 0.35%: 1.1641 : 0.033 2022 : 0.35%: 1.1641 : 0.033			•					8.65
2015 0.352 1.1359 0.076 2016 0.352 1.1379 0.065 2017 0.352 1.1479 0.065 2018 0.352 1.1479 0.055 2019 0.352 1.1519 0.055 2020 0.352 1.1560 0.047 2021 0.352 1.1600 0.045 2022 0.352 1.1641 0.035			! 2014	0.00%			0.0839 ;	8.73
2016 : 0.35%; 1.1399 : 0.065 2017 : 0.35%; 1.1439 : 0.063 2018 : 0.35%; 1.1479 : 0.057 2019 : 0.35%; 1.1519 : 0.057 2020 : 0.35%; 1.1560 : 0.047 2021 : 0.35%; 1.1641 : 0.039 2022 : 0.35%; 1.1641 : 0.039				0.00%			0.0763	
2017 0.35% 1.1439 0.063 2018 0.35% 1.1479 0.057 2019 0.35% 1.1519 0.052 2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.043 2022 0.35% 1.1641 0.033								8.88
2018 0.35% 1.1479 0.057 2019 0.35% 1.1519 0.057 2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.047 2022 0.35% 1.1641 0.039		9.8399	2017	0.00%			0.0630	8.94
2019 0.35% 1.1519 0.052 2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.043 2022 0.35% 1.1641 0.039			: : 2018	0.00%			0.0573 ;	
2020 0.35% 1.1560 0.047 2021 0.35% 1.1600 0.045 2022 0.35% 1.1641 0.035				0.00%			0.0521	9.05
2021 0.35% 1.1600 0.045 2022 0.35% 1.1641 0.035		10.0204	• • • • • • • • • • • • • • • • • • • •	1 0 0051				9.10
2022 0.35% 1.1641 0.039			2021	0.00%				9,14
			: : 2022	0.00%			0.0391	
2023 : 0.00%; 1.1641 ; 0.035				0.00%			0.0356 ;	
2024 : 0.35% 1.1681 : 0.033			! ! 2024	0.007!				9.25
2025 0.35% 1.1722 0.029	-	•		0.00%			0.0294	9.28
2026 0.35% 1.1763 0.026				0.00%			0.0267	9.30
2027 0.35%; 1.1804 0.024				0.001		0.0243		

SCHEDULE E CONSTRUCTION ESCALATION TABLE USING ZERO ESCALATION (#11lions of dollars)

	:	PRETREATMENT PLANT										HWVP ADDITIONS								
	Percent Estimate Expended 1988 \$								Percent E Expende					Est. in Const \$						
1982	; (7	0.0	 ¦	1.00		0.0	;	0.0	;	0ኔ;	0.0	;	1.00	1	0.0)	0.		
1939		7,			1.00	f	0.0	1	0.0	;	0%;	0.0	1	1.00	;	0.0	ţ	0.		
1990	; (7	0.0	1	1.00	l 1	0.0	ı	0.0	i	0%;	0.0	ŀ	1.00	1	0.0	ŀ	0.		
1991	; (ንኢ	0.0	;	1.00	ţ	0.0	;	0.0	ļ	0%;	0.0	1	1.00	;	0.0	ŀ	0.		
1992	; (7	0.0	ļ	1.00	•	0.0	ŧ	0.0		07;	0.0	1			0.0	-	0		
1993	; 1	7	4.6	ŀ	1.00	i	4.6	ŀ	2.9	ŀ	07:	0.0	i			0.0		0		
1054	; 3	7	13.8	į	1.00	ŀ	13.8	ŀ	7.8		07;	0.0				0.0		0		
1995	1 4	Ä	12.4	1	1.00	l ł	18.4	1	9.4	ţ	0%;	0.0	į			0.0		0		
1996	10	7	46.0	i	1.00	1	46.0	ŀ	21.5	;	0%;	0.0			ł	0.0		0		
1997	; 15	7	69.0	ŀ	1.00	1	69.0	ì	29.3	ŀ	0%;	0.0				0.0		0		
199B	; 24	7	110.4	ŀ	1.00	1	110.4	;	42.6	1	07:	0.0				0.0		0		
1999	: 27	7	101.2	ŀ	1.00	ŀ	101.2	ŀ	35.5	1	0%;				!	0.0		0		
20 00	11	7	50.6	1	1.00	ŀ	50.6	i	16.1	1	0% }		i		-	0.0		0		
2001	; 7	7	32.2	į	1.00	1	32.2	1	9.3	į	0%;					0.0		Q		
2002	-	7.			1.00	•	13.8	•	3.6	-	0%;					0.0		0		
2003		7		-	1.00		0.0		0.0		0%;				•	0.0	-	0		
2004	; (7	0.0	;	1.00	:	0.0	i	0.0	.!.	07;	0.0	i 	1.00	i 	0.0	i 	0 		
	100	7	460.0	1	XXX	1	460.0	;	177.9	1	02;	0.0	;	XXX	ţ	0.0	;	0		

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NEW BUILDING DESIGN LCC WORKSHEETS

I. PROJECT DESCRIPTION

AGENCY: Department of Energy

ADDRESS: STREET

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CITY/COUNTY Hanford STATE Washington

DOE REGION 10

PROJECT CONTACT PERSON: NAME

POSISTION TELEPHONE

BUILDING OF FACILITY DESCRIPTION: INDUSTRIAL FACILITY - COLOCATED PRETREATMENT FACILITY

CLASSIFICATION FOR ENERGY CHARGES: Industrial

PROJECT DESCRIPTION: High Level waste processing facility including buildings, installation of all

equipment, offsites and engineering

EXPECTED BUILDING OR SYSTEM LIFE: 40 years or greater

ESTIMATED BUILDING OR SYSTEM INVESTMENT COST: \$392,000,000 Pretreatment Plant (total installed cost) \$44,000,000 HMVP Additions (total installed cost)

ENERGY INFORMATION:

Energy Type: Electricity

Annual Quantity

Price Unit

3.53E+07 kwh

\$0.0294 per kwh

Energy Type: Steam

Annual Quantity

Price Unit

9.980E+07 1b

\$9.50 per 1000 lb

PERIOD OF STUDY:

2003 (start-up) To

2022 (end year)

NO OF YRS COVERED:

20

BASE YEAR:

1988

DISCOUNT RATE:

10%

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Calculating the Presen	t Value of Energy	Costs			•
	(1) 	; (2) ; Base-Year !Energy Price	;	: (4) :Escal. Adjusted: : Present Worth :	
Туре				Factor	
Electricity - kwh	3.53E+07	(per kwh) \$0.0294		2.7810	\$2,887,000
	; ; ;	Base Charge	`i		
	; ; ; ;	Desand	: : :		
		Time of Day	-{ -{ - -		
	1	: Capacity 	- - - !		
	t 1 1 5 3	Other	; -; ; ;		
Steam - lbs	9.9B0E+07	(per 1000 lb ; \$9.50		2.7810	\$2,636,00
TDTAL	xxxx	: xxxx	; xxxx	: xxxx	\$5,523 ,0 0
Calculating Investment	Costs for the New	Building Des			
(1) PV Estimated Actu	al Investment Cost	s for the New	Building Desig	ment Plant	\$151,626,00 \$27,179,00
(2) Investment Cost A	djustment Factor			:	K
(3) Adjusted Investme	int Cocte				\$178,805,00

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NEW BUILDING DESIGN LCC WORKSHEETS (Continued)

C. Calculating the Annually Recurring (Nonfuel) Operation and Maintenance (B&M) Costs

I tes :	(1) Amount of Annually Recurring Costs in Base Year Dollars	(2) Modified UFW Factor	(3) Present Value of Annually Recurring Costs
Normal Maintenance Materials	8,080,000	2.2419	\$18,114,000
Operating & Maintenance Labor	14,890,000	2.2419	\$33,382,000
Consum Chem Usage - 1st 10 yr	2,640,000	1.6181	\$4,272,000
Consum Chem Usage - 2nd 10 yr	1,750,000	0.6238	\$1,092,000
Radwaste Disposal Costs	0	2.2419	\$0
Fixed Operational Cost Assessments	1,200,000	2.2419	\$2,690,000
TOTAL :	xxxx	: xxxx	\$59,550,000

. Calculating	Nonannually Rec	urring (Nonfue	1) O&M Costs, Re	palcement Co	sts, and Salvag	e Valu	£	
(1) Year in Which Expenditure to Occur	(2) Amount of Non Annually Recurring D&M (Base Year \$)	Replacement Cost	: (4) Amount of Salvage Value (Base Year \$)		(6) PV of Non- Annually Recurring D&M		(7) PV of eplacement	(8) PV of Salvage Value
2023	Decontaminati		(43,600,000)	0.0356	1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		; ; ;(1,551,467
	*	1 1 1 1 1 1 1 1			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	\$ \$ \$ 1 1 1 2 5 5		; ; ; ; ; ; ;
TOTAL	; xxxx	XXXX	: xxxx ;	XXXX	!	; ; ! !		; ;(1,551,000
. Calculating 1		Value Energy (Costs				\$5,523,000	
	(2) Present	Value Adjusted	j Investment Cos	ts		+	\$178,805,000	•
	(3) Present	Value of Annua	ally Recurring (Nonfuel) D&M	Costs	+	\$59,550,000	• ,
	(4) Present	Value of Nonar	nnually Recurrin	g (Nonfuel)	D&M Costs	+	\$0	
	(5) Present	Value of Repla	acement Costs			+	\$0	•
	(6) Present	Value of Salva	age			-	(\$1,551,000)	- •
	(7) TLCC of	the New Build	ing or Syste∎ De	sign		=	\$245,429,0 00	<u>.</u>

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COMPONENTS OF LIFE CYCLE COSTS 1988 BASE YEAR = ! Estimated | | Constant Dollar | Base Year Estimate | : Estimate : Cost : Frequency : Nominal \$ (Escalation Rate) Constant Dollars Component : Year Equiv. Total Installed Cost 392,000,000 1988 |Lump Sum (\$392,000,000 ; Pretreatment Plant 44,000,000 44,006,000 | 1988 |Lump Sum HWVP Additions (43,600,000) (43,600,000); |Salvage Value(Decommissioning)| 1988 Lump Sum 8,080,000 8,080,000 ; 1988 : Annual . !Norsal Maintenance Materials ! 14,890,000 14,890,000 ; 0 : Annual 1988 Operating & Maint. Labor(*) 1,037,820 1,037,820 (Per Sched. A 1986 ¦ Annual (Elect. Energy Usage Costs(1) 948,100 Per Sched. A 948,100 1988 Annual (Steam Usage(#) ; (elec boiler); 2,640,000 2,640,000 1988 Annual Consum Chem Usage 1st 10 yr(*); 1,750,000 ; 1,750,000 1988 Annual [Consum Chew Usage 2nd 10 yr(*)] 0 ; 198€ Annual :Radwaste Disposal Costs(1) 1,200,000 ; 1,200,000 1988 : Annual (Fixed Oper. Cost Assess'ts(*) : Note: The values for asteristed (‡) components of Life Eycle Costs include a 20% contingency

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Section 2

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SCHEDULE E CONSTRUCTION ESCALATION TABLE USING ZERD ESCALATION (#illions of dollars)

	1		PRETRE	ATM	NT PLAI	łT				1		H	IVP	ADDITI	DN5			
Year	Percen Expende		Estimate 1988 \$									stimate 1988 \$				it. in onst \$		PV kpend.
1988)%;	0.0	; ;	1.00	!	0.0	;	0.0	;	1%;	0.4	?	1.00	;	0.4	;	0.
1989	1	120	0.0	1	1.00	1	0.0	;	0.0	;	27.	0.9	í	1.00	1	0.9	1	0.
1990	1) ኢ :	0.0	ŀ	1.00	1	0.0	ł	0.0	1	4%	1.8	1	1.00	1	1.8	i.	1
1991)%;	0.0	1	1.00	1	0.0	;	0.0	;	10%	4.4	ţ	1.00	1	4.4	1	3
1992	1	7,	0.0	;	1.00	1	0.0	1	0.0	1	15%	6.6	1	1.00	1	6.6	1	4
1993	1 1	12;	3.9	ţ	1.00	1	3.9	1	2.4	ŀ	24%	10.6	ï	1.00	i	10.6	ŀ	6
1994	1	S.,	11.8	;	1.00	1	11.8	i	6.6	ì	227	9.7	¦	1.00	ŧ	9.7	ŀ	5
1995	1	17.	15.7	ŀ	1.00	1	15.7	į	8.0	ŀ	117	4.8	:	1.00	1	4.8	ŀ	2
1996	; 1)7.;	39.2	;	1.00	1	39.2	į	18.3	;	7%	3.1	;	1.00	ţ	3.1	-	1
1997	; i	1	58.8	i	1.00	1	58.8	ŀ	24.5	ŧ	37.	1.3	ļ	1.00	1	1.3		0
1998	; 2	17 }	94.1	;	1.00	1	94.1	ŀ	36.3	;	17.	0.4		1.00		0.4	1	0
1999	1 2	27.	86.2	;	1.00	;	86.2	ŀ	30.2	1	0%;	0.0		1.00		0.0		0
2000	; i	17;	43.1	ŀ	1.00	1	43.1	1	13.7		0%;	0.0		1.00		0.0		0
2001		77		¦	1.00	:	27.4		7.9		0%;	0.0		1.00		0.0		0
2002		37.			1.00		11.8		3.1		0%;	0.0	•	1.00		0.0	-	0
2003		7.			1.00	-	0.0		0.0		0%;			1.00		0.0		0.
2004		7.	0.0	i 	1.00	i 	0.0	i 	0.0	i !-	07.	0.0	i 	1.00	۱ 	0.0	1 	0.
	10)%:	392.0	;	XXX	!	392.0	;	151.6	:	100%;	44.0	;	XXX	:	44.0	į	27

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NEW BUILDING DESIGN LCC WORKSHEETS

I. PROJECT DESCRIPTION

AGENCY: Department of Energy

ADDRESS: STREET

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CITY/COUNTY Hanford STATE Washington

DoE REGION 10

PROJECT CONTACT PERSON: NAME

POSISTION

TELEPHONE

EUILDING OR FACILITY DESCRIPTION: INDUSTRIAL FACILITY - INTEGRATED PRETREATMENT FACILITY

CLASSIFICATION FOR ENERGY CHARGES: Industrial

PROJECT DESCRIPTION: High Level waste processing facility including buildings, installation of all

equipment, offsites and engineering

EXPECTED BUILDING OR SYSTEM LIFE: 40 years or greater

ESTIMATED BUILDING OR SYSTEM INVESTMENT COST: \$0 Pretreatment Plant (total installed cost)

\$519,000,000 HWVF Additions (total installed cost)

ENERGY INFORMATION:

Energy Type: Electricity

Annual Quantity

Price Unit

3.25E+07 kwh

\$0.0294 per kwh

Energy Type: Steam

2000000000000000000000000

Annual Quantity

Price Unit

9.980E+07 1b

\$9.50 per 1000 lb

PERIOD OF STUDY:

2002 (start-up) To

2021 (end year)

NO OF YRS COVERED:

20

BASE YEAR:

1988

DISCOUNT RATE:

107

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Calculating the Present	Value of Energy	Losts			
	: Annual Units	Base-Year Energy Price	: Base-Year	(4) Escal. Adjusted: Present Worth	Present Value
Туре	Purchased	; Per Unit	Energy Costs	; Factor :	of Energy Lost
Electricity - kwh	3.25E+07	(per kwh) \$0.0294	\$956,000	3.0555	\$2,921,000
	! ! !	Base Charge	; !		
	; ; ;	Demand	i : :		
		Time of Day	; ; ;		
	1 1 1 1	Capacity	 		
	1	 Other 	: -: :		
Steam - 1bs	; ; 9,980E+07	(per 1000 lb); \$9.50		3.0555	\$2,897,00
TOTAL	; xxxx	; xxxx	; xxxx	XXXX	\$5,818,00
. Calculating Investment	Costs for the New	Building Des	ign		
(1) PV Estimated Actua			Building Design	gn tment Plant	\$ \$250,310,00
(2) Investment Cost Ac	Ijustment Factor			;	x
(3) Adjusted Investmen	. Parks				\$250,310,00

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NEW BUILDING DESIGN LCC WORKSHEETS (Continued)

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C. Calculating the Annually Rec	urring (Nonfuel) Operation	and Maintenanc	e (O&M) Costs
lte=	•	(2) ! Modified ! ! UPW Factor !	(3) Present Value of Annually Recurring Costs
Normal Maintenance Materials	7,880,000	2.4661	\$19,433,000
Operating & Maintenance Labor	14,890,000	2.4661	\$36,720,000
Consum Chem Usage - 1st 10 yr	2,640,000	1.7799	\$4,699,000
Consus Chee Usage - 2nd 10 yr	1,750,000	0.6862	\$1,201,000
Radwaste Disposal Costs	0	2.4661	\$0
Fixed Operational Cost Assessments	1,200,000	2.4661	\$2,959,000
TOTAL	****	: xxxx :	\$65,012,000

. Calculating	Nonannually Re	curring (Nonfus	:1) O&M Costs, Re	palcement Co	sts, and Salvage	Value	
(1) Year in Which Expenditure to Occur	Recurring 00	: Replacement	: (4); Amount of; Salvage Value; (Base Year \$);	Factors	(6) PV of Non- Annually Recurring O&M	Replacement	; (8; ; PV of ; Selvage ; Value
	!	;			; ;		1 4
2927(\$)	Decontaminat Decomplesion		(51,900,000)	0.0243	i		;(1,261,399
	: ning with HWVF on campaign of	following 25 y peration.	yr.		t 1 1		• • • • • • • • • • • • • • • • • • •
		1			i		; ! !
TOTAL	; ; xxxx	xxxx	; xxxx ;	XXXX	1		; ;(1,261,000
. Calculating t		t Value Energy				\$ 5,818,000	
	(2) Presen	t Value Adjuste	d Investment Cos	ts		\$250,310,000	•
	(3) Presen	t Value of Annu	ally Recurring (Nonfuel) O&M	Costs	+ \$65,012,000	•
	(4) Presen	t Value of Nona	nnually Recurrin	g (Nonfuel) C	MAN Costs	\$ ()	•
	(5) Presen	t Value of Repl	acement Costs			+ \$0	•
	(6) Presen	t Value of Salv	age			- (\$1,261,000)	- -
	(7) TLCC o	f the New Build	ing or System De	si g n		= \$322,401,000	

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 Component	Estimate Year	: Cost : Frequency			:Base Year Estimate : Constant Dollars
!		1	1	1	1 !
Equiv. Total Installed Cost		i		1	
Pretreatment Plant		Lump Sus	\$0	; 0	; V
HWVP Additions	1989	Lump Sur	519,000,000	;	519,000,000
Salvage Value(Decommissioning)	1988	Lump Sum	(51,900,000)	0	(51,900,000)
Normal Maintenance Materials	1989	Annual	7,880,000	0	7,880,000
Operating & Maint, Labor(*)	1908	: Annual	14,890,000	0	14,890,000
Elect. Energy Usage Costs(*)	1988	Annual	955,500	Per Sched. A	955,500
Steam Usage(1)	1988	: Annual	948,100	Per Sched. A	948,100
Consum Chem Usage 1st 10 yr(*);	1986	Annual	2,640,000	(elec boiler)	2,640,000
Consum Che# Usage 2nd 10 yr(*):	1988	: Annual	1,750,000	; 0	1,750,000
Radwaste Disposal Costs(*)	1988	: Annual	0	: : 0	0
Fixec Oper. Cost Assessits(1);	1988	; ; Annual	1,200,000	. 0	1,200,000

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SCHEDULE E CONSTRUCTION ESCALATION TABLE USING ZERO ESCALATION (#illions of dollars)

	1	5	PRETREA	TME	NT PLAY	ŧΤ				ł ł		H i	łγF	· ADDITI	ONS			
Year		cent Est nded 19										Estimate 1988 \$				ot. in onst \$		PV pend.
1985	;	0%;	0.0	;	1.00	}	0.0	1	0.0	!	0%	0.0	;	1.00	1	0.0	;	0.0
1050		0%!	0.0	ŀ	1.00	1	0.0	1	0.0	i	0%;	0.0	î	1.00	;	0.0	i	0.0
1996	1	0%;	0.0	:	1.00	1	0.0	1	0.0	!	17	5.2	į	1.00	1	5.2	1	4.3
1991	1	0%;	0.0	:	1.00	i,	0.0	i.	0.0	1	27		i	1.00		10.4		7.8
1992	1 1	0%;	0.0	;	1.00	1	0.0	1	0.0	1	4%			1.00		20.B		14.2
1993	; ;	07;	0.0	;	1.00	1	0.0	ì	0.0	!	107;			1.00		51.9		32.2
1994	1	0አ :	0.0	1	1.00	1	0.0	ŀ	0.0	į	137			1.00		67.5	;	38.1
1995	i i	0%;	0.0	!	1.00	1	0.0	1	0.0	1	157	77.9	ł	1.00	1	77.9	ł	39.9
1996	1	0%;	0.0	:	1.00	1	0.0	;	0.0	!	15%;	77.9	;	1.00	i I	77.9	1	36.3
1997	1	071	0.0	1	1.00	1	0.0	;	0.0	!	131	67.5	;	1.00	1	67.5		28.6
1998	1	0%;	0.0	1	1.00	1	0.0	;	0.0	1	10%	51.9	1	1.00		51.9		20.0
1999	1	0%;	0.0	ŧ	1.00	ŀ	0.0	ŀ	0.0	1	8%;		ŀ	1.00		41.5		14.5
2000	1 1	02!	0.0	1	1.00	1	0.0	ŀ	0.0	1	6%			1.00	ļ	28.5		9.i
2001		0%;	0.0	ŧ	1.00	ŧ	0.0	ŀ	0.0		37			1.00		15.6		4.5
2002	: ;	0%:	0.0	•	1.00		0.0		0.0		17.			1.00		2.6		0.7
2003		0%;	0.0		1.00		0.0	- 1	0.0		02;			1.00		0.0		0.0
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- 6.2 A facility plot plan was not prepared for the three pre-treatment alternatives. It is recommended that plot layouts be developed to support subsequent studies of the alternatives. As an example, for the co-located facility, a preferred location was identified at the current location of canister storage building (in close proximity to the sandfilter). A plot layout would confirm the location and establish more exact estimates of supporting utilities, piping, tunnels and ductimg.
- 6.3 After development of process flow diagrams, the cell arrangement and configuration should be verified.
- 6.4 The use of the overhead cranes should be studied to verify the canyon size, both in length and height, and to establish availability under various scenarios.
- 6.5 Manipulator repair space was allocated based on a subjective evaluation of each pre-treatment alternatives. It is recommended that the manipulator repair area/areas be studied in greater detail considering time/motion analyses.
- 6.6 Areas such as the Operations Control building and Regulated Entrance Facility were factored from known HWVP requirements for each pre-treatment alternative. These requirements should be studied in greater detail.
- 6.7 Failed Equipment Handling for each pre-treatment alternative assumed three cells were required to maintain plant availability. The failed equipment handling requirements deserve further study.



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- 6.8 Steam utilization and the use of electric steam versus 200 Area steam should be investigated in greater detail.
- 6.9 Utilization of cold chemical tankage, including consideration of cold chemical tank location, should be evaluated in greater detail.
- 6.10 The use of shared facilities for the co-located and integrated facilities needs to be explored in greater depth. Approximations and factors were used in preparing the current "first-pass" evaluation.
- 6.11 A risk analysis is recommended to determine the extent of technology development needed for conceptual, preliminary and detailed designs. Examination of Design parameters may permit a "fast track" approach to definition of the pre-treatment facilities.
- 6.12 The pumping distances involved and the logistics of pumping, sampling, blending, draining and feeding, while maintaining steady plant operations, requires study to determine if additional LAG storage tanks are required and where they should be located.
- 6.13 Further study of process tank location would develop preference between cell location and vault location for tanks such as the Low Level Waste.
- 6.14 In consideration of SST waste pre-treatment/processing, retrieval methods could involve slurrying the solids from leaking SST tanks in a vault near the tanks or hauling the solids to the pre-treatment plant in shielded transporters. Planning should include further

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studies and development of viable methods of handling the SST wastes.

- 6.15 Sampling and Analytical Facility requirements were assumed equivalent to HWVP. These requirements deserve further study.
- 6.16 The facility fire protection/detection system requirements should be evaluated in greater detail. The potential for an in-cell fire as a result of the selected pre-treatment process may require an in-cell fire protection/detection system.
- 6.17 The pre-treatment schedule should be analyzed to address details such as the pre-treatment development program activities and their integration with HWVP engineering and construction and PSAR and permitting requirements. Funding authorization profiles should be evaluated as well.

APPENDIX A

EQUIPMENT LIST STAND-ALONE FACILITY

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5 X 2 STOPLESS STEEL STEEL STEEL	75		HAINTENANCE SAMPLE CELLS	TOTAL EQUIPMENT DECON PERAIR & MA
		1 1		CAR DECON EGOLLARIA
DIMENSION MATERIAL STRINLESS STRINLESS	CAFASITY DIM		LOCATION DIV	5EK 8483EM

RPPENDIX B

EQUIPMENT LIST INTEGRATED FACILITY

SHARLE FORE &	ELIVIAL B	ABITATOR A	STUDGE RECEIVER B	SLUNGE KECEIVER B	SCHESS REGEIVER P	DISSOLVER B - ENTRAINER	DISSULVER & STARTE PART &	4 10141129 8 130702510	N BOLDLICH A SAN COSTO	8 1980 13458848 8 83N 105518	DISSOCIES & TRANSPER FURR A	in the second se	PETTATOR B	SCUISE RECEIVER A	STARTE MELETINE B	4 45 13 38 35 15 15	SUMME PECENTER F	COLOR NOTA SEE -EMILY OTHER	THE PLANE A SAME EN PLANE A	DISSELVER A ASTRICE B	DISSOLVER A ASITATOR A	DISCLUSE H TRANSFER PURE B	DIBEGUVER & THANSFER FUNF A F	4 33-105510	13F
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					25000	10 6PK						42000 682					2450 BK	16. EP.		ļ				42000 BAL	CAPACITY
					6HL 15 NIDE X 15.5 HIGH X 20 LONG	MODULE 15 WITE X HIBH X 20						E164 / 27.10%		<u> </u>			15.MISE) 15.5 HIGH Y 20. LONG	15 (491H) 20 12 81DE 1						HIGH X 27 LONS	
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	SGLVZIT STOFASE TARY PROCESS LELL	DE THE COIL	PROCESS	SOLVERY WASH WASTE TAVE. PROCESS	£830£55	MRH MRT IN COOLIG COIL	SOLVENT MACH MESTE THAN FRACESS	FROCESS CELL AGDIATOR A	FEEL PUMP A	SOLVENT FEED TAND CODLING COIL	SOLVENT FEED TANK	FRUCESS CELL	TRANSFER FERSIVER AND FRESESS OF	TAG		FEED PURE H	FEED SME TAN COOLING COL	FEET FUNCTION FRONTESS CELL	HEITATE 16 TAIN 1919AT 1911 -	4 3873 3323544.	PEER HOLE IN TAKE COOLING COIL	RESERVE OF THREE PROCESS CELL	THANSFER PUMP A	INHT DEFES SCEBE RCV TH CL COIL	HAR OFFERE SCHOEBER KECVE TAN PROCESS CELL	STAN CONTECTION 18/0 PAGGESS CELL	TIER LOC-TION
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TEE SHIFTE BECK CODENS COT					0 P
THANSTER PUMP A	PROCESS CELL				
HELLOWERSHYE RECEIVER	EXOCESE CELL				
REGERERATION WESTE TANK	PROCESS CELL	4	199 5901	4 BIH X 16 HIGS	. STEEL . STEE
RESERVENTA WETE TO COOLING COIL					S.E.E.
eHe EICLEL Y	FF22E55 CELL	-	\$49 9Z	2 E X 8 LONG	13913 5141415 5141415
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FRECCAT FEET TANK	EROCESS CELL	4	399 (1)(0)	4 D 1 10 H	3315
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TRANSFER PLKP A	FAOCESS CELL				
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		 	1	IN KLDG DOT-OF-CELL	1191 G334 R011010S 4141S
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•••	,			IN REGS OF THE PETE	TRANSFER PUNF A
STAINLESE	4.5 X 410.2 4	789 695	,	IM PED8/001-04-2ETF	SCEND SOCUTION FEED TANK
			ļ	·	TOTAL IN-CELL EDVIPKENT
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13315; 53378,515,			설	PRULESS CELL	
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4 6 014	500 6AL	<u> </u>	IN BLOG/DUT-OF-CELL	FRE-COAT FEED TANK
1			IN BLDG/DUT-OF-CELL	3.0K SODIUK HIDKOIDE ADDITION TAKK - ABITATOR A
			11 BC06/001-06-CELL	3.0M SOCIUM HIDRO-IDE ADOITION TAUX - TRANSER PUNE A
	500 GAL 4	Н	IN BUTZ-DUT-DF-CELL	STOK SECTIVE HEREVALUE
		-	IN BLDG/GUT-OF-CELL	0.58 SOFTUM HYPESTITE ASSITTON TAKE - ASTRATOR A
		Н	IN BUDS/OUT-OF-CELL	ADDITION TAND - PUMP A
	2(6) BAL 1	-	IN BLDG7DGT-DF-CELL	ADDITION TANK
		-	IN PLOS OUT-OF-CELL	6.35 FIFE ACIL ABOITION TAN
		-	14 F-15-301-07-1E-1	CREASEER FURE A
tre 1	759 995	•-	IN BLDS GUI-DE-DELL	G.3W WITHIE ACTO ADDITION TAIN
		•	IN BLIGGOT - DE-CECT	K. IR RITKIC ACID ADDITION TARK MSITHIOP A
		-	IN BUDE DUT-DE-CECC	TRAKSFEE FUME P
-54	779 005		1137-56-162-9978 HI	O. IF HITPIC ACID ADDITION THAT
			11: 51.63/601-0=-0611	TI RESENERATION MALEUR TANK
		-	14 ELES 131-12-1211	11 RESERVEDENTED WATER TARE
 	500 60	-	1915-16-154, 931-1)) 유럽한 작품수는 10차 씨와 된것은 1구의
		-	1730-40-180, 9478_A1	SECTION RANGE THE
			58 F. T. O. T 05 - C.	- 15年(17年) 15年(17年
tar	562 6AL		IV BELLO GALLOCATETE	SOUVER HATEUR TANK
		•-	1132-20-10C 5078 NI	8 - 30 - 31 - 32 - 32 - 32 - 32 - 32 - 32 - 32
		-	IN ELECTION DESCRIPTION	TRANSTEF FURT A
-5-1	500 641	<u> </u>	<u> 1135 - שנישה יטיו - טור-כפנר</u>	BASH SOLUTION FEED TANK
		-	14. 8FDE 0012-06-5EFF	RELIBION &
t			IN BLDG OUT-OF-CELL	STRIK SCLUTTOK FEEL 1640
	CAPACITY	107	רטכאווסא	

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TEANSFEE PUNE A	TAN		PUNE A		DFF-GAS TECHTRENT SCHION	NITE THE PURE A	OFF-GAS TREATMENT SOCIUM	13. KA EEF TAN (E) PET TATE A	THE STATE OF THE S	IN HATELE TRANSPORT	#114195 447 4117 3117 101 4 HOLDER 1417 1617 1617 16	HITHER HALL BY STORM STORM ACTION ACTION ACTIONS ACTION AC	CONTESTE ABILITADA 1845 SOBIUM	1917154 FETETIVE 500100:	HITCHE RECEIVER SOMINA	PITELL SECTION 1941	PERFORM FEED THAT	4 200 155 1544 155 155 155 155 155 155 155 15	PEROLINE FEED THAN	TOP WITTE ACID ACIDION TAN	TRANSFER PURP ADDITION TON	128 ALLEIC WOLLIGH LYA	ASTRIOS A	TRANSEER PURE A	
IN FLD6/OUT-OF-CELL	IN BURG7OUY-DF-CELL	IN BLD6/001-0F-CELL	IN BLOG/OUT-OF-CELL	IN BLDG-DUT-DF-CELL	IN BIDG-DIL-DE-CELL	IN BLD670UI-DF-CELL	11.91-90-100-9019 NJ	IN BLDG OUT-OF-CELL	IN ELDEVINY-OF-CELL	IN F196 041-05-0ELL	18 8058 00,-08-08TT	18 6.55 001-01-251	11. 90° 001-0:-CELL	3.8 60.60 -00 -0E.C	14 <u>BLES-6011-0P-0ELL</u>	737-30-100.3174.41	IN PERSONAL DEFORES	IN PUBLICATION OF SECTION OF SEC	THE BLUE OF A TOP ACELL	THEO-LOG-LOG-DELL) IN 9176-GIT-GE-CELL	7193-20-100, 2018 MI	1337-40-180, 9034 MI	IN BLDS-DOT-DF-CELL	LOCATION
J	1-1	-			4				4			-		 	٦			·-	1-		• <u>-</u>	·· '.	·' -		, ear
	Şêê GÂZ			50% BAL		***************************************	200 BKL			263 662			200 845			149 (03			51. BAL			789 265			CAPACITY
	4.9.015 X 2.14.			4'6'DIA X 5'H			म इ. ४.स.व.२.५			4.5.614 1.5.8			4 6 014) 5 H			E S E			4 5 1 7 1 2 9 4			4.9.016 X 2.H			DIKENS:OH
	STATALESS			STEEL			SCHILLESS			STAINLESS			3318 3414 352 3714 318 318 318 318 318 318 318 318 318 318			93.01.01.01.01.01.01.01.01.01.01.01.01.01.			STATES			SIEL			KPTER : AL

TRANSFER PURP A	TBP FECEIPT/STORAGE TANK	NAM BECEIFT STOKAGE TAIN	NºH RECEIPT/STORAGE TANK	RESTATOR A RESTATOR AS	THANSFER PUNE A	(NYL VIA NOLLITUS HSTM	#2125.06 & 101 .US.	LE PARCEU AND UNITED SECTION WILL LEWI	SEED TOURS TAIN	STREET SERVICE HE THE	LECTE SUFFICE TO THE	SERUE SOCUTION MIX TAK:	TRANSPER FLAF A	HYDROGEN FEFOLIDE STOFAGE TH	TEANGEE PURE A	SOCIUM HIDROLIDE STURKEE TANK	4 800 a	WHI BEFFORE TITE CHAIN	TOTAL COLD CHEMICAL IN BLD6	ECTATOR P	TRANSFER FUNCTION TANK	1881, 1981, 1984, (1881)	IN MATERIC TANK AGITATON A	
NOT 1H BLOG?	BOI IN BLOG/	ON1-OE-CETT NOT IN BIDG/	OUT-OF-CELL	NOT IN BLIG!	ODI-DE-CELT NOT IN ETDE:	NOT TH FLOG	118-01-01-01-01-01-01-01-01-01-01-01-01-01-	NO: IV BLIE	1130-40-LIIG	, ODLI - OF - CELL - MOT IN BEING	061-0E-0ECT 0611-0E-0ECT	NET THE SECTION OF TH	NOT IN BLUG	STEE THE SECTION OF T	OUT-OF-CELL	1001-0F-CELL 1001-11 8006	BUT-DE-CELL	1001-06-061E 1001-06-061E		IN BUNG OUT-OK-CETT	11. 8028-001-08-6657	TIN ECOG-GOT-DE-CELL	118_BC06/001-06-CEFF_	1
-	-	<u></u>	H	-		4					-		H	H	e.4	e	p.			,_	4			V18
	2000 BAL		2000 BHL			2001 EAL			2000 BAL			2000 64.		20000 642		26660 661		2				500 54		CAFACITY
	H16H H16H		7 0°D X 7 0"			H16H H16H			H9TH 1.0.1.1.0.0			7 0°5 % 7 0° H35H		4 9 E 1 46 I DKG		HIGH F F I F E F		15 65 1 15 E				H.S. Y. HID. 3. Y		DIMENSIGN
	STATMLESS.		STEEL STAIL CESS			OFFI THE NEEDS			13313			STEEL		TOKE : ALDATHUR		CAPEON		9 45 8 6 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5				ELEET TEEE		MATER I AC

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LOCATION (GT/ CAPACITY	
001-0CELT 200 GST 4.94E	133181 1418 1418 1418 1418 1418 1418 141
NET IN BLDG.	
101 1K 8116	
NOT IN BLDS 1 50. GAL 4 8	H STEEL STAINLESS
001-06-0677	
GOT-EF-CELL 1	
001-08-08LL 3 500 6AL (4 5)	13 1 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
001-0c-0ELL NOT IN BLD6	
107 1H ELES/	
199 90 90 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	H SEEL STAINLESE
1413 107 IN BLD6/ 2	
14NF NOT 1N 8155	 .
120 18 120 120 130	
1-35-30-33 30-3-38-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-	H 2 0 2 0 2 (17) 2 0 4 (17) 2 (17)
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	13318 13318 14.5
끊ㅋ	13315 13315
02-CETT 1 2000 CUT	13318 13318 13318 14.58
EFT - 1 - 2000 GET - 2000 GE	1331.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 500 GHL	13318 13318 13318 14.58
### HERE 101 500 GAL 1001 1001 GAL	13318 13318
#27 IN HEEG 1 500 GAL	13318 13318
FOT 14 FLOS 2 2 500 SAL 501-0F-CELL 2 500 SAL 501-0F-CELL 2 500 SAL 501-0F-CELL 2 500 SAL 501-0F-CELL 3 501-	2 cm

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HEEM	LOCATION	1	CAPACITY	MOTENEMIA	METERIOL
PHEUMATIC TRANSFER SYSTEM		-		72	33 13 13 13 13 13 13 13 13 13 13 13 13 1
HEINKELE INVIEE SYSTEM	ı.				
TRANSFER DESMERS	TSAMFLE FANALTT RECK			2 1 2 1 2	STEEL
SHYLE ROTULES	STREET CELLS	k	15 4		13316
TOTAL PROCESS SAMF_ING					
HOT LAS EQUIPMENT	H31 1.PE	10			217. N. E. S.
COLF LAS EQUIPMENT	14. LAP	6			
TOTAL RACETICAL FACILITIES					
	1731-10-179 1974831		36.15%	100 M 100 M 100 M	1915.
540 M # 1 3 145c	PATHT, RETOTE CELLS	0			1.Ent. 61.635
SELECT MANGES	יאלאינים אבאלונים ספרדא. ו	<u> -</u>			1000
8951EF 51.4VE #ARIP-BL#-10FS	WATOUS FEMOTE CELLS	Page 1	NODEL F		1315
ELECT MECH NAMPOLATORS	RENOTE MAIN CELLS	 	-1968 3844 		STAINESS
Age Capits	KSN PEFFIE	þ.	SINGLE		LAFE.
STIELT WINDS CAST	Main After	 -			STEEL
5848E	CINT	H	三 三		STEEL STEEL
CFP12 N.C.5, Y0125, 4 BAILS	CARTON	E	No. 101		STEINLESS STEEL
CUI-UP ROOK EQUITMENT	101-1F F00K	E			
FECH RENOTE LIGHTS	ECR	 -			316 316 316 316 316 316 316 316 316 316
TOTAL REKOTE HANDLINS EDUIPHENT					
TOTAL BRAND, ALL EDUIPMENT					

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INITIOPALED CASE - MASIE PPETERINEN PLANT

ITEK	LECATION	i AIB.	CAPACITY	NOTENESTICAL PROPERTY OF THE P	विश्वताम् ।
JUNEERS	PROCESS CELL	17		2"	1331S THE 151
EMBERGER FIRE ID SALLERY	CELL WALLS	<u> </u>		1.3	
KEPOTE IN-CELL PIPE KACH LINES CELL NACLS	S CELL MALLS	<u>.</u>		1-3	33181 1218181

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RPPENDIX C

EQUIPMENT LIST CO-LOCATED FACILITY

SHALE PARE &	SCUDGE RECEIVER &	SLUGGE RECEIVER B	SCUMBE RECEIVER B	SLUGGE RECEIVER B	DISSOLVER 6 CONDENSER/DE-ENTRAINER	DISSOLVER & SAMPLE PUMP A	DISSOLVER E ASITATOR B	DISSOLVEK & ACITATOR A	DISSOLVER & TRANSFER PUMP B	DISSOLVER & TRANSFER FUNE A		SCUDSE RECEIVER A	STUDGE FECEIVER A	SHAPLE PUMP A	STUDGE FECEIVER A	STRICE RECEIVER A	DISSOLVER A CONDENSER/DE-ENTRAINEP	DISSOLVER A SAMPLE PURF A	DIESOLVEK A AGITATOK B	FDIBSOLVER A ABITATOF A	INTESOLVER A TRANSFER FUNE B	DIESOLVEK A TRANSFER PUMF A	D1950_48F A	
PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	1133 SS30044;	PROCESS CELL	PROCESS CELL	PROCESS CELL	AKOCESS CELL	PROCESS CELL	1130 5530044	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	FROCESS CELL	LOCATION
<u>-</u>			<u></u>	4	<u> </u>	<u>-</u>	4	-	<u>-</u>	p			4	-	-	4	<u>-</u>			-4				1917
				29000 BAL	10 6PH						42000 GAL					29000 BAL	10 GPK						42000 BAL	CAPACITY
				15.WIDE X 15.5'	HIGH X 20' LONG 15' WIDE X 15'						15. MIDE 1 15.5 HIGH X 27. LONG					15 WIFE X 15.5	HIGH X 20. LONG 15. WIDE X 15.						HIGH X 27 LONG	DIMENSION
551 304L	SET 304L	5S1 304L	551 3041	557 304L	STATILLESS	HASTELLOT C-276	HASTELLOY C-276	RESTELLOY C-276	HASTELLOY C-276	H45TELLOX C-276	HASTELLOY C-276	551 3041	\$51 304L	551 304L	551 3041	55T 304L	STAINLESS	HASTELLOY C-276	MASTELLOY C-276	RASTELLOY C-276	RHSTELLE: C-276	HASTELLOY E-276	1965 ELLO	HATERIAL

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HILEM	LOCATION	418	CAPACITY	DIMENSION	KATERIAL
ROY TOWERS & 4 D X 20'H, W/ BUEBLE CAP TRAYS)	PKOCESS CELL	~		HODULE X 15. 15. HIDE X 15. HIGH X 20. LONG	SIEEL SEETALESS
NO: TOMERO	יְּבְּאַטְנְבָּאָבְ נָבָּוָנִ				
NO TOWERS PURE E	PRODESS CELL				
RECOVERED WITHIC TARK	PROCESS CELL	4	32000 BAL	15 WIDE X 15.5' HIGH X 22'LONG	STATRLESS
RECOVERED NITRIC TANK TRANSFER PUMP A	PROCESS CELL				
RECOVERED NITRIC TANK ABITATOR A	PROCESS CELL	-			
RECOVERED NITEIC TANK	PROCESS CELL				
SUPERIATE FEED/RECEIVER A	PROCESS CELL	4	28(()() SAL	15 WIDE X 15.5" HIGH X 20"LONG	STAINLESS STEEL
STOPPONTE FEEL/RECEIVER A	PROCESS CELL	-			
SUPERWATE FEED/RECEIVER A	PROCESS CELL				
SUFERNATE FEED/RECEIVER A	PROCESS CELL	4			
SUPERWATE FEED-WECETARY R	PARCESS OFFI		28000 GAL	HIGH X 20 LONG	STAINLESS STEEL
SUPERNATE FEED/FECETVER P	PROCESS CELL				
SUFERNATE FEED/RECEIVER B	PROCESS CELL				
SUFERNATE FEED/RECEIVER F	PROCESS CELL	4			
LON LEVEL WASTE TANK A	PROCESS CELL		40000 BAL	15 WIDE X 15.5 HIGH X 27 LONG	STEEL
TRANSFER PURF A	PROCESS CELL				
LON LEVEL WASTE TANK A	PROCESS CELL				
COW LEVEL WASTE TANK A	PROCESS CELL				
LOW LEVEL WASTE TANK B	PROCESS CELL	-	10000 BAL	15 WIDE X 15.5	STEEL
TRANSFER PUMF A	1130 5530084				
AGITATOR A	PROCESS CELL				
LES LEVEL WASTE TAKE B	PROCESS CELL	'۔۔۔۔ ا			

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TEN CETVEF COTTVEF (CETVEF (CETVEF CONTENSER OF GOOLING COIL RU RECEIVER A RU RECEIVER A RU RECEIVER B RU RECEIVER B			CAPACITY 1400 EAL 1400 EAL 6000 EAL 6000 EAL	DIRENSION WATERIAL DIRENSION WATERIAL STATINGES STAT
RECEIVER BECEIVER B	PROCESS CELL	r- r-	3000 641	H91H 01 X H1G.
TRU CONTENDATE RECEIVER TRU CONDENSATE RECEIVER ABITATOR A REGENERATION WASTE TANK	PROCESS CELL PROCESS CELL		1000 BAL	H91H_01_X_11G_
REGENERATION WASTE TANK PEGENERIN WSTE TY COOLING COIL	PROCESS CELL	Ą	1000 BAL	A.DIY. A. TO.HIBH. SIEET
PHP FILTER A	PROCESS CELL	4	20 68K	2.D X B. LONE
PHF FILTER B	PROCESS CELL	4	20 GPK	2.D 7 8.TOM8
PRECDAT FEED TANY COOLING COIL	HAGGESS CELL	4	1000 6 AL	H.01 X G.*
PRECOAT FEEL TAN) TRANSFER PUMP A	PROCESS CELL	·-		
COAT FEED TANK TATOR A	PROCESS CELL	-		
NHS SCRUBBER CONCENTRATE RECVE NHS SCREE CONCE REVE COOL COIL	PROCESS CELL	4	1000 GAL	5'0 X 7'H
RH: SCEUBREK CONCENTRATE RECUE TRANSFEE POMP A	PROCESS CELL	Н		
HAZ SCROBBER CONCENTRATE RECVE	PROCESS CELL	4	•	

STRIP SOLUTION FEED TANK	SCPUE SOLUTION FEED TANI	STRUB SOLUTION FEED TAKE. TRANSFER PUMP A	SCRUB SOLUTION FEED TANK	TOTAL IN-CELL EQUIPMENT	SURP JETS	क्रिया उद्दाह	OFF-GAS FILTER	OFF-BAS NEATER	NH3 SCRUBBEK CONCENTRATOR CONDENSER	NH3 OFF GAS SCRUBBER N/BUBBLE CAF TRAYS	NH3 SCRUBBER SOLUTION	CE CONCENTRATOR CONDENSER	CE CONCENTRATOR	11 COTAIN	I) SOLVERT COLUKY	TRUEY SOLVENT NASH KODULE	TRUET STRIPFER KODULE STRIF CENTRIFUGAL CONTACTORS	TRUEY SCRUE MODULE SCRUE CENTRIFUSAL CONTACTORS	TRUE) EXTRACTION HODULE EXTRCIN CENTRIFUGAL CONTACTORS	HAS SCRUBBER CONDENSATE RECUR HOTTATOR A	TRANSFER PUNK A	NHT SCRUESER CHONST REC COOL COIL	ITEM
IN BEDG/OUT-OF-CELL	IN BLDG/OUT-OF-CELL	IN BEDS/DOI-OF-CELL	IN BEDS/OUT-OF-CELL		PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PROCESS CELL	PRICESS CELL	PROCESS CELL	PRICESS CELL	PROCESS CELL	PROCESS CELL	FRacess cell	PROCESS CELL	PROCESS CELL	PFOCESS CELL	FROCESS CELL	PROCESS CELL	물
 	 -	<u>-</u>			6	썱	-	-		Н	-	-			니			니		-	-	p	A LEG
506 BAL			500 GAL		25 6PK		1500 SCFH	1500 SCFM	20 6PM		20 6PH		10 6FK	3000 6AL								400v 6AL	=
4.6°DIA X 5.8			14 6"DIA X 5"H						3.0 X 7.H	6.7 X 15.H	H. 21	2'D X 6'L	15'H	H. ST X 0.9	H.9 f (L.)	2'# % 10'L % 6'H	4.1.6	KODULE 8.H	#0DULE 4'# } 12'L X				NOTON
STEEL			STEEL		STAINLESS	STAINLESS	STATINLESS	STAINLESS	STEEL	SIEEL	STEEL STEEL	STEEL STEEL	STAINLESS	STEEL	STATMLESS	STEEL	STATHLESS STEEL	3537HF418	STEEL			SO STATE	MATERIAL

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SIEEL	4.5.8 410.9.4	500 BAL		IN BLDG/OUT-DF-CELL	PRE-COAT FEED TAND
				IM BLD6/OUT-DF-CELL	3.0M SOLIUM HOROLIDE ADDITION TANY - ABITATOR A
			اا	IN BLD6/DU1-DF-CELL	3.0M SODIUK HYDROXIDE ADDITION TANK - TRANSER PUKE A
STEEL	4.6.DI8 X 2.H	500 BAL	- -	IN BLDG/OUT-OF-CELL	3.0H SEDIUK HYDEOXIDE ADDITION TANK
			Н	IN BLDG/OUT-OF-CELL	O.5H SODIUM HYDROXIDE ADDITION TANY - ABITATOR A
			۲	IN BLDG/DUT-OF-CELL	0.5K SODIUK HYDFOXIDE ADDITION TANK - PUKE A
STEEL	4.6.DIG.9.P		H	IN BLD6/DUT-DF-CELL	6.5H SODIUM HYDROXIDE
<u>'</u>			Н	IN BLD6/001-DF-CELL	0.3K NITRIC ACID ADDITION TARE ASITATOR A
·			ᅥ	IN BLDG/DUT-OF-CELL	O.3H NITEIC ACID ADDITION TANK TRANSFER PUMP A
STEEL	4.9.DIY X 2.H	500 BAL		IN BLDG/DUT-DF-CELL	O.3K NITRIC ACID ADDITION TANK
			ы	IN BLD6/OUT-DF-CELL	GIH NITRIC ACID ADDITION TANK ABITATOR A
			•	IN BLDG/DUT-OF-CELL	G.IN HITEIC ACID ADDITION TARE
STEEL	4.9.018 X 9.H	500 BAL	•-	IN ECD6/OUT-OF-CELL	O.IM NITRIC ACID ADDITION TAND
				IN BLDG/OUT-DF-CELL	IX REGENERATION NAVEUF TANI
			- -	IN BLDG/OUT-DF-CECL	IV RECENERATION MAYEUP TARK
STAINLESS	4.9.014 X 2 H	500 GAL 1	F++	IN PLDG/OUT-OF-CELL	IX FEGENESATION NAVEUR TANN
			<u>-</u>	IN BLD6/001-0F-CELL	SOLVENT MAKEUP TANI.
			١	IN BCDB/001-0F-CELL	SOLVENT KAKEJE TAKK TRANSFER PUNF A
STEEL	4-6-DIK X 5-H	500 EAL A		IN BLDG/OUT-OF-CELL	SOLVENT MAYEUS TANI
			* ~	IN BLD6/OUT-OF-CELL	RASH SOLUTION FEED TANN ABITATOR A
			닉	IN BLDG/DOT-DF-CELL	TRANSFER PUMP A
STEEL	4.9.DIU X 2.R	500 BAL 4		IN ELDG/OUT-DF-CELL	WESK SOUDTION FEED TANN
			<u>'-</u>	IN BITES/OUT-OF-CELL	STRIP SOLUTION FEED TANK
			1-	IN PUDE/DUI-DE-CELL	TRANSFER PUMP A
MATERIAL	DIMENSION	CAPACITY	9TY :	LOCATION	ITEM

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TRANSFER PIKE A	I) HAVEUR TANK	OTILITY TARE. IN BLD6/DUT-DF-CELL II - I	TRANSFEF PUNP #	DTILITY TANY IN BLDG/DUT-OF-CELL I	OFF-645 TREATMENT SODIUK IN BLD6/DUT-OF-CELL I	DEF-GAS TREATMENT SODIUM IN BLDG/DUT-DF-CELL I	OFF-GRS TREATMENT SODIUM IN BLDB/OUT-OF-CELL 1	IN BLD6/DUT-DF-CELL 1	TRANSFER PURF A	IX MATEUR TANN (Cs) IN BLD6/DUT-OF-CELL 1	LOW LEVEL WASTE TANY SOCIUM IN BLOG/OUT-OF-CELL 1	NITRITE ADDITION TANK-PUMP 6	LOW LEVEL WASTE TANN SORTUM IN BLDG/OUT-OF-CELL 1	STUDGE RECEIVER SODIUM IN BLOGTOUT-OF-CELL 1	NITRITE ADDITION TAXY-PURP &	STAGE ETCEIVER SODIUM IN BUDG-OUT-OF-CELL 1	PERSONINE FEED TARK IN BLIG/OUT-OF-CELL 1	TRANSFER FUNP 6	PEROXIDE FEED TAKE IN BLDG/OUT-OF-CELL 1	ACTITATOR A	128 NITRIC ACID ADDITION TARE IN BLD6/BUT-DF-CELL 1	12F NITHIE ACID ADDITION TANK IN BLOGFOUT-OF-CELL 1	1004 FEEL TANS 1N BLD6/QUY-OF-CELL 1
						500		-		500			500 B			500 6			500 SAL			789 JOS	 <u></u>
4.5.018			<u> </u> 	910.9.1		<u> </u>	6AL 476"DIA	<u> </u> 		68: 4 6*DIA		<u> </u> 	910.9.1			GAL 4'6"DIA			476.DIA			VIG. 9. 1	
0	┥			14 X 2.H			14 X 5.H			19. X. 2.8			H.S. X 91			H.S X 91			H S X 9.1			H.S.Y.	
1	STEEL			STEEL			STEEL			STEEL			STAINLESS			STAINLESS			SIEEL			STEEL	

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		118	CAPACITY	DIMENSION	MATERIAL
TI MATEUR TARK	IN 8LD6/DUT-OF-CELL	۲-			
ELUANT ADDITION TANK	IN BEDG-DOT-DE-CELL	4	749 JAS	4.9.018 X 2.H	STEEL STAINLESS
ELIMPT ARCHION TAIN.	IN BLISTOUT-DF-CELL	4			
ELUAN' ADDITION TAND	IN BLD6/OUT-OF-CELL	-			
TOTAL COLD CHEMICAL IN BLDG		ĺ			ĺ
NITFIC ACID STORAGE TANK	NOT IN BLDG/	-	20000 BAL	H914 12.0.0 X 12.9.	SIEEL SIAINLESS
RITRIC ACID STORAGE TARK TRANSFEF FUM: A	NOT IN BLDG/	4			
SODIUK HYDROXIDE STOCKBE TANK	NOT IN BLOS?	د ا	20000 BAL	15'0"D X 15'6"	CARRON
SOLION HIDROTIDE SIVE TANI TERNETER PURE A	HOT IN BLOG/	ᆈ			
ATDEGEN FERGIDE STOFAGE TI	BUT-DF-CELL	Ħ	20000 6AL	9'0"D X 40'LONE	ALUKINUK
HYDROGEN FEROXIDE STORAGE II.	NOT IN BLDG/	Ħ			
SCEUF SOUDION WIX THRE	OUT-DE-CELL		2000 GAL	7.0.D X 7.0.	STATINLESS
SONCE SOLUTION SIX TAN-	NOT IN BLDG:	<u>Ц</u>			
SCRUB SOLUTION MIX TAN! ASITATOS A	BOT IN BLDG/				
STRIP SOLUTION KIX TANI	NOT IN BLDG/	4	2000 GAL	7'0'5 X 7'0"	STAINLESS
STRIP SOLUTION KIX TAKE TRANSFER PUMF A	NOT IN BLDG;	H			
STRIP SOLUTION RIV TARN	NOT IN BLDG/	4			
WASH SOLUTION MIX TANI	NOT IN BLDG!		2000 BAL	7'0°D X 7'0° HIGH	STAINLESS
WASH SOLUTION KIX TANI TRANSFER PUMP A	NOT IN BLDG/	4			
ABITATOR A	NOT IN BLDG/	<u>-</u>			
NFH RECEIPT/STORAGE TAN	NOT IN BLDG/	H	2000 GAL	7.0.0 X 7.0.	STAINLESS
NPH RECEIFT/STORAGE TANK TRANSFER PUMP A	NOT IN BLDG!				
TBP RECEIPT/STORAGE TAN	NOT IN BLDG/	4	2000 GAL	7'0"[X 7'0"	STATALESS
TEO RECEIPT, STURAGE TANK	OUT-OF-CELL				

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4 6°D) 5.0°	STEEL STRINLESS
4.9.0 1 2.0.	STEEL
	•
4 6.8 X 2.0.	STAINLESS
	1 17% [] [7]
	1 1776 [1 779
	ien 1 1 1774 E 1 1778
	STAINLESS STAINLESS
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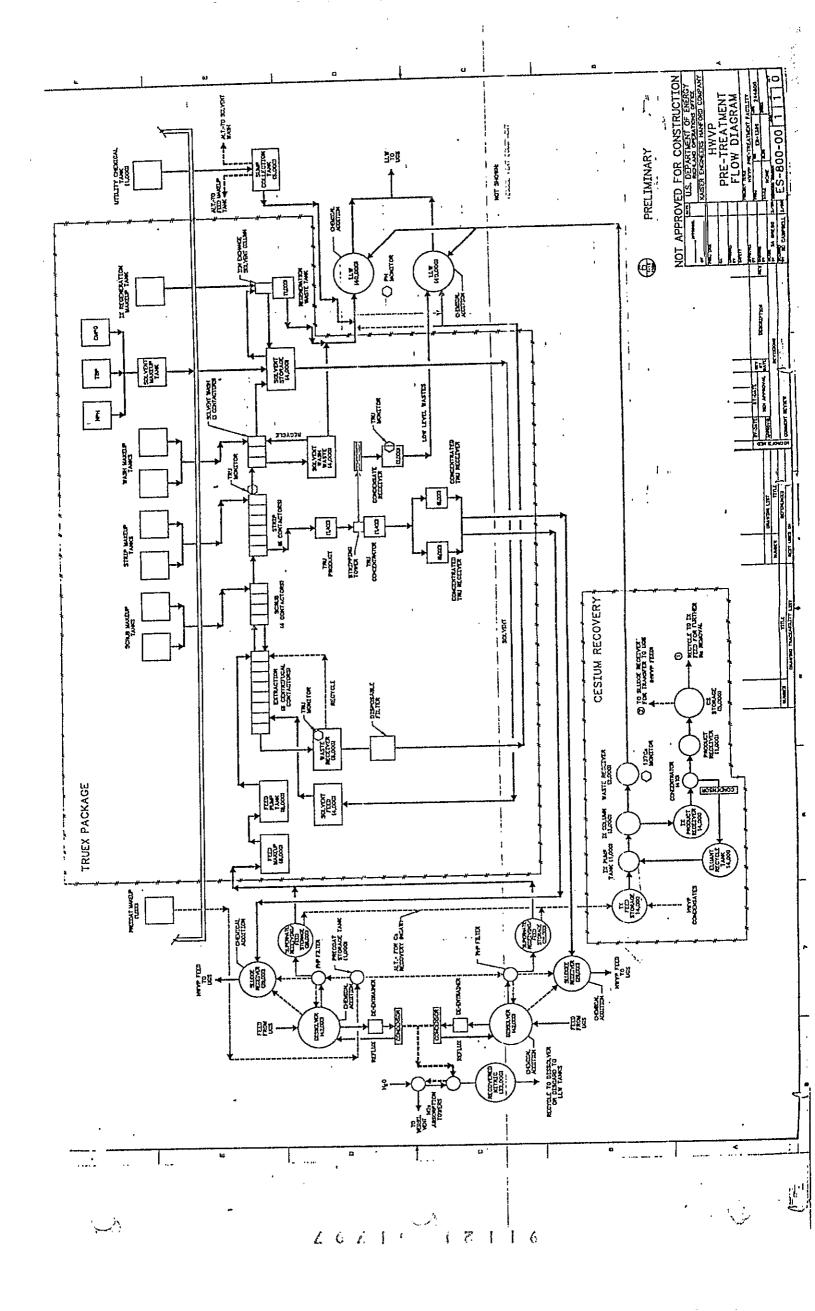
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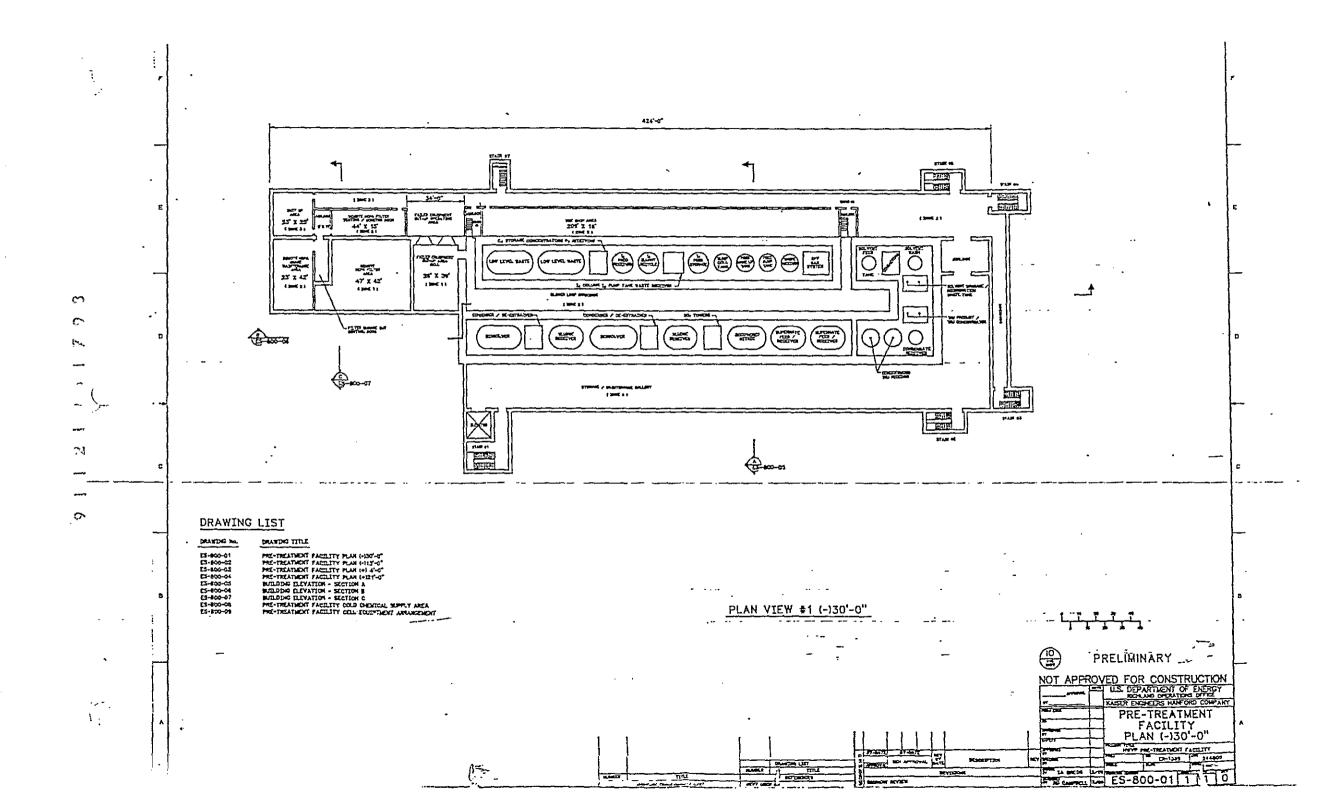
	LOCATION	1017	CAPACITY	DIMENSION	KATERIAL
PREUMATIC TRANSFER SYSTEM	ANALYTICAL CELLS	اء		2*	STAINLESS
DECON GLOVE BOX	MSM REFAIR	<u> </u>			STATHLESS
DRY DECON ECHIPHENT		9			
TOTAL EQUIPMENT DECON REFAIR &	KAINTENANCE	ĺ			
TRANSFER DRAWERS	SARFLE/AHALYT ROOK	-		2 X 2 X 2	STAINLESS
SAMFLE KOODLES	SAMPLE CELLS	섫	15 KL		STATINLESS
TOTAL PROCESS SAMPLING		ĺ			
HOT LAR EQUIPMENT	HOT LAS	=======================================			STAINLESS
COLT LAS EDUTSHENT	COLD LAB	目			
TOTAL ANALYTICAL FACILITIES		Ì			
CRAYE	CANTON/OUT-DE-CELL		30 TON	75' X 11 X 20	CARBON
SHIELE MINOPE	KATHT. REKOTE CELLS	허			LEAD BLASS
28° SHIELD WINDOWS	SAKFLE REHOTE CELLS	=			LEAD 6LASS
KASTER SLAVE MANJEULATORS	VARIDUS REKOTE CELLS	ន	KODEL F		STATHLESS
ELECT MECH MANIFULATORS	REHOTE HAIN CELLS	4	PAR 3000		STATMLESS
MON CARTS	MSK REPAIR	 دم	SINBLE		STEEL
SHIELD WINDOW CART	HAINT AFEA				THEFT TOTAGE
COKC CRAKE	CDKC		7.5 100		CARBON STEEL
CHA SHIELD DOOR/HDIST	CRA	Ì			STATHLESS
CHANE BLOCKS, YOKES, & BAILS	CANYON	9	30 TDN		STATHLESS
CUT-UP ROOM EQUIPHENT	CUT-UP ROOM	9			
FECA REMOTE LIGHTS	FECA	-			STATINTESS
TOTAL RENDTE HANDLING EQUIPMENT	(Ì			
TOTAL BRAKD, ALL EQUIPMENT			ני		-

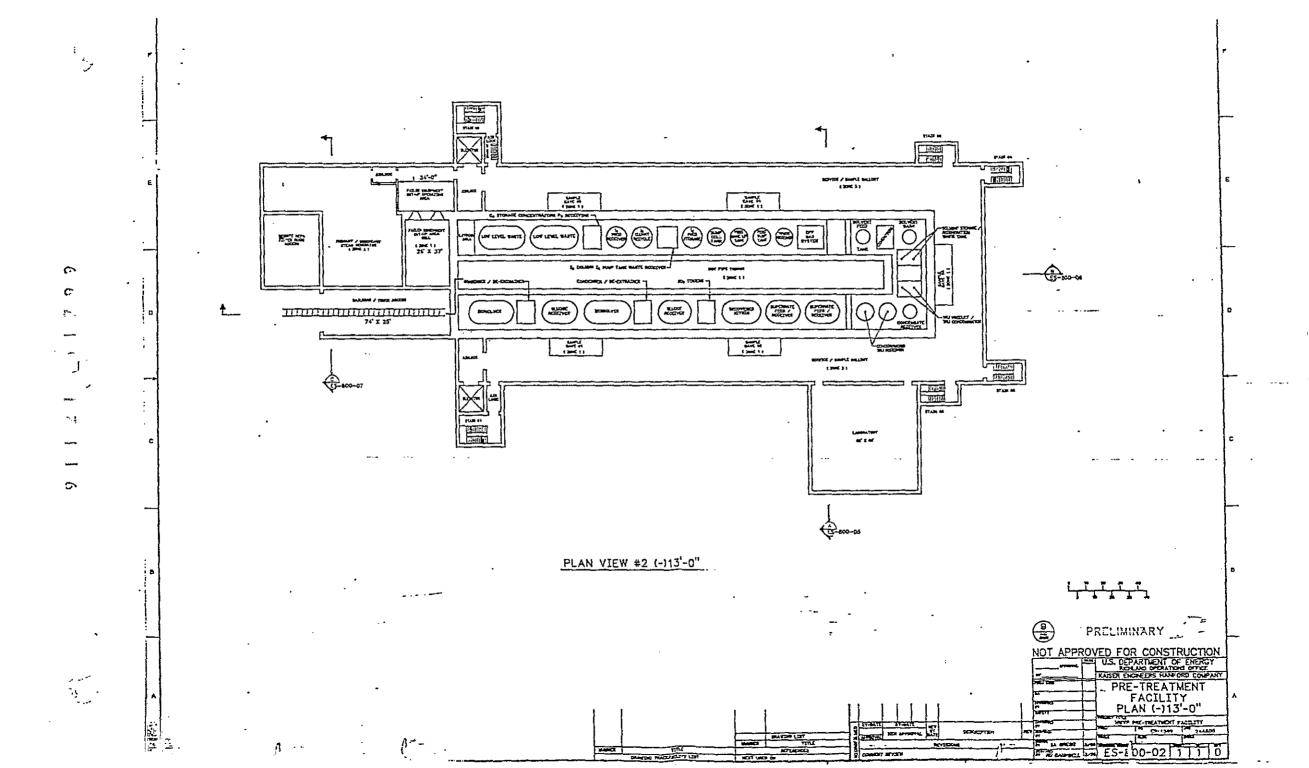
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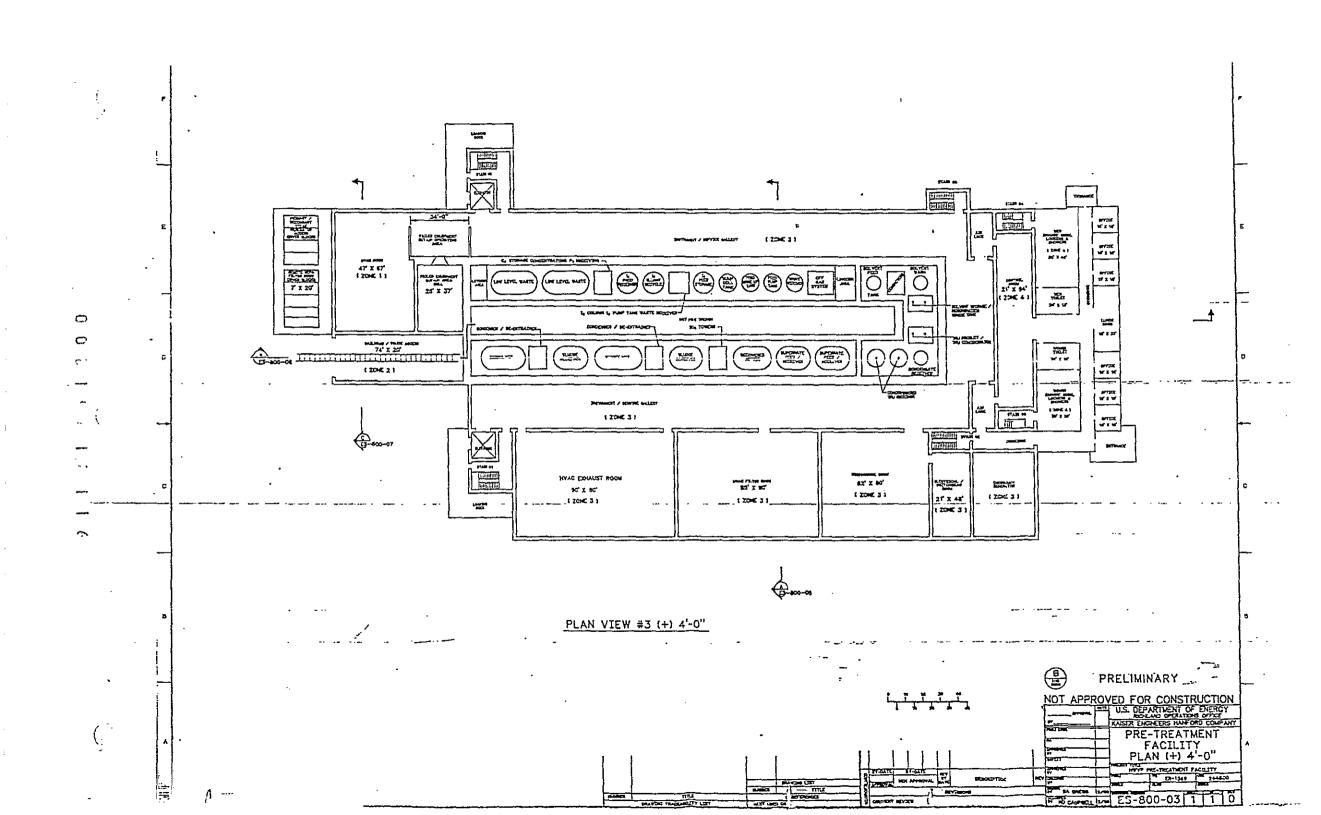
APPENDIX D

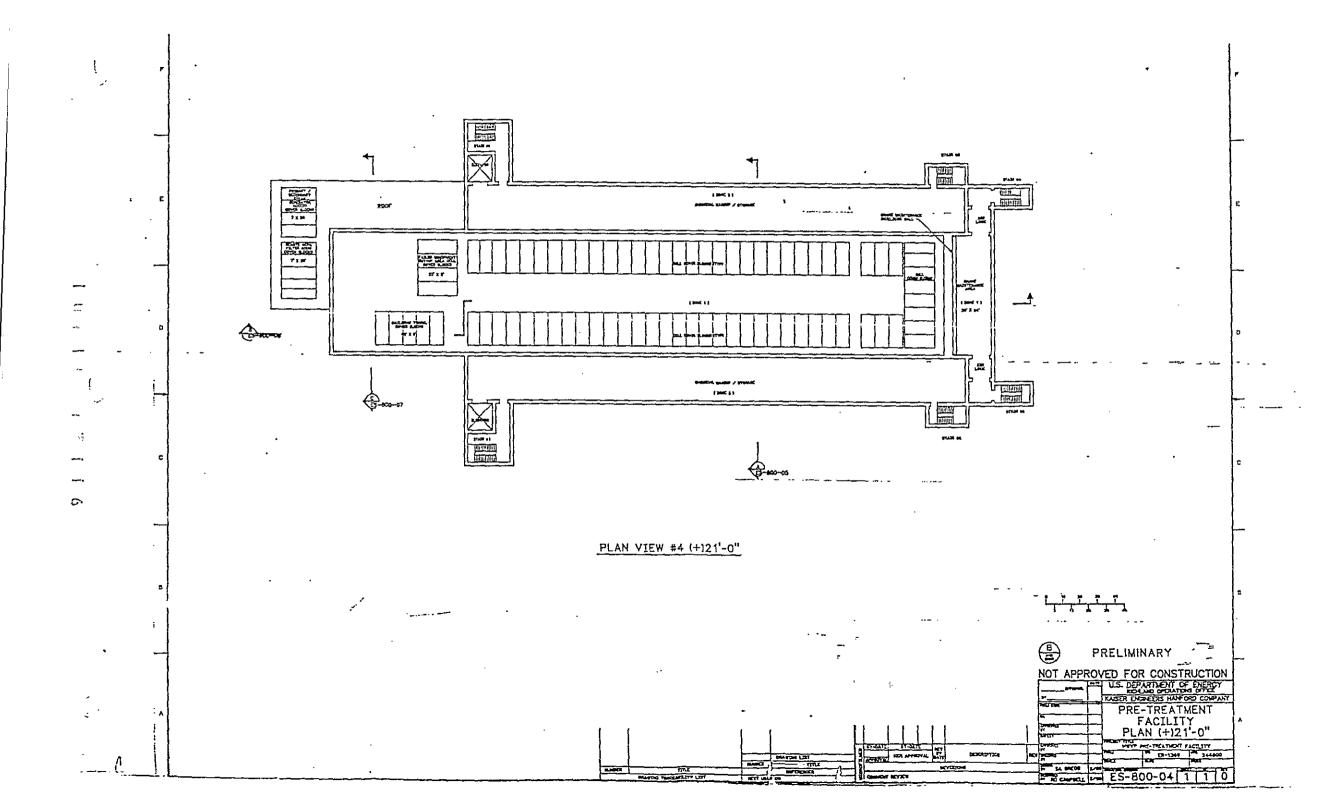
FRCILITY DRAWINGS WESTINGHOUSE RLTERNATIVE

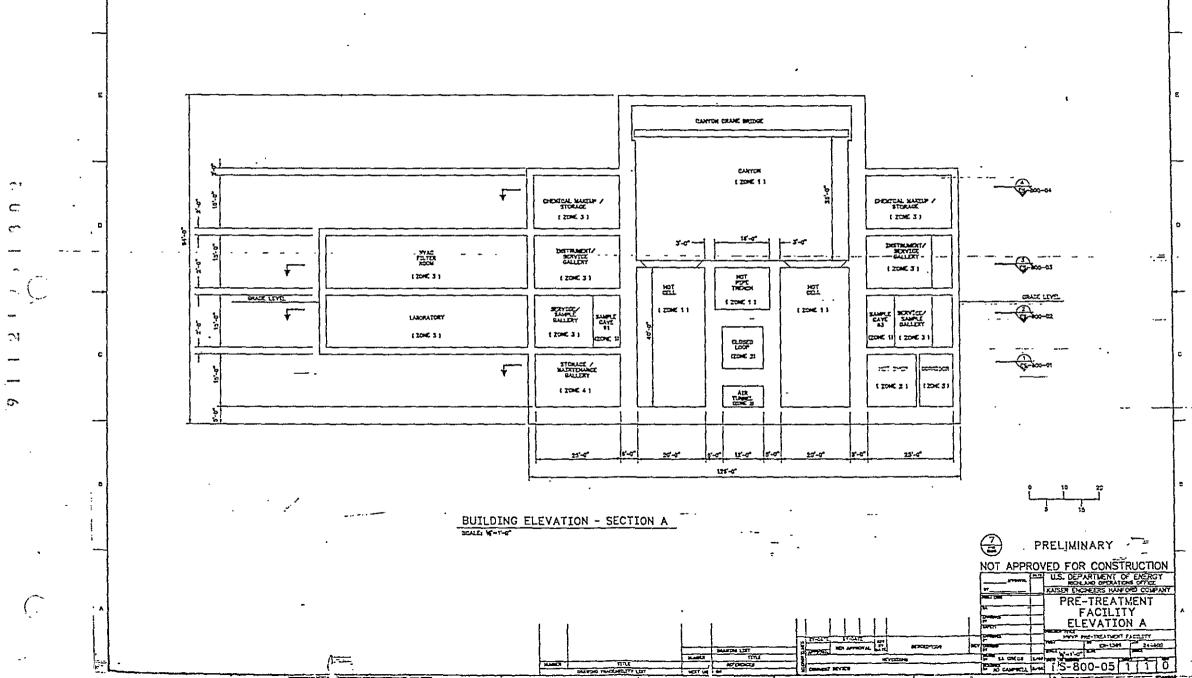












DELLICE CONSTITUTE HOL SHOEK -25 3 mand Leve. -43 rest, BUILDING ELEVATION - SECTION B PRELIMINARY NOT APPROVED FOR CONSTRUCTION

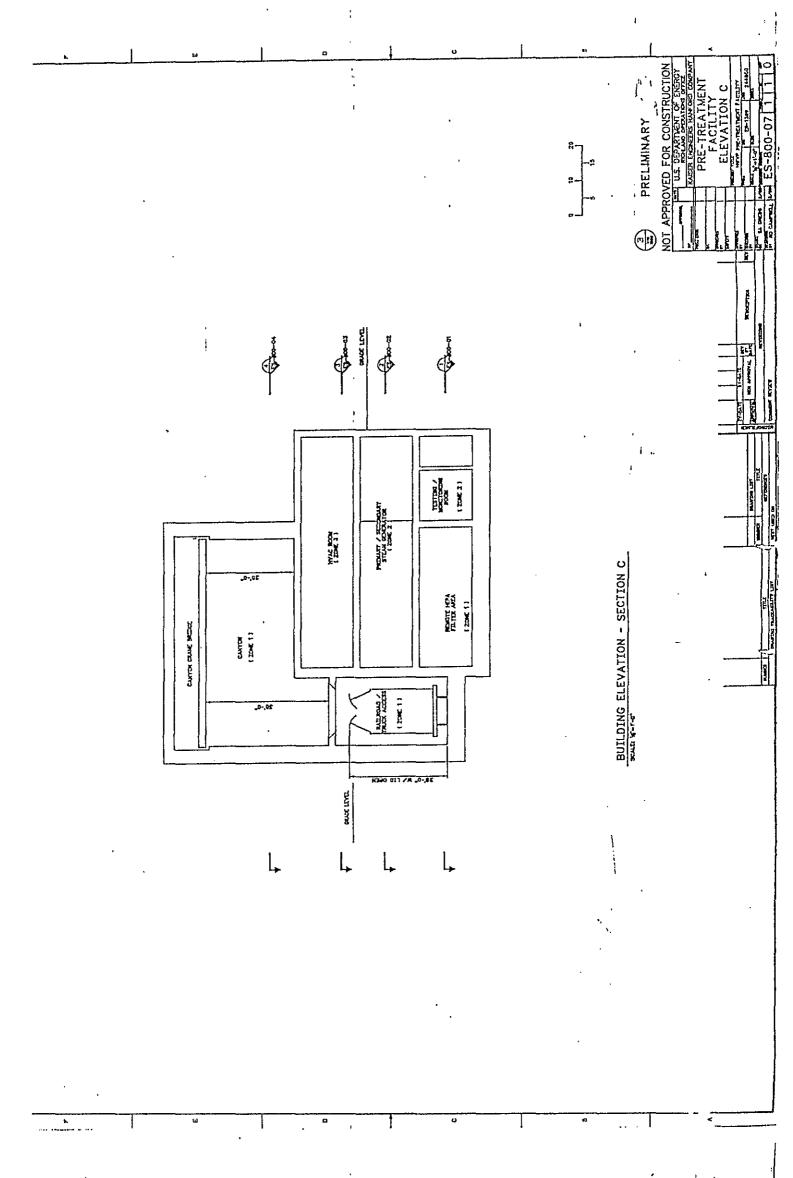
U.S. DEPARTMENT OF ENERGY

EXAMPLES INVESTIGATION

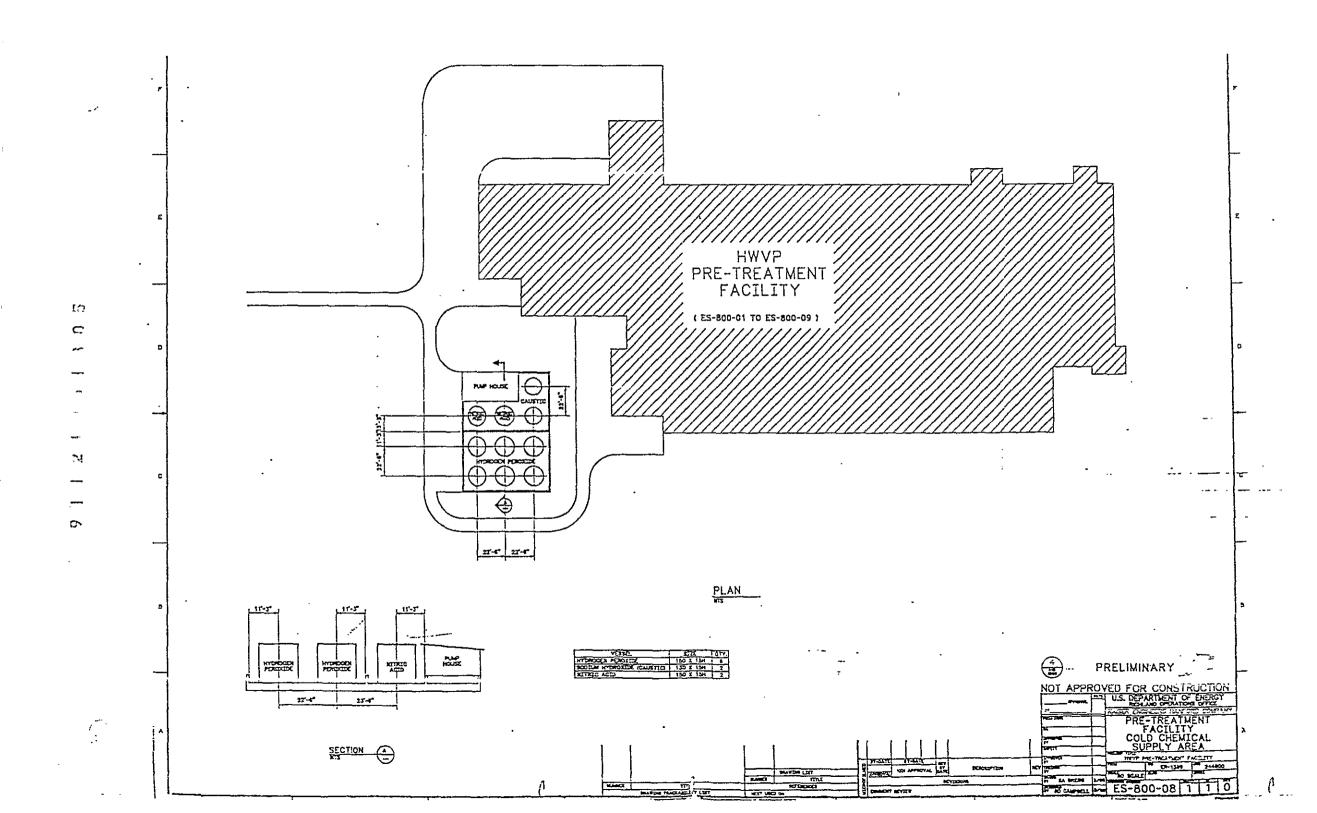
PRE-TREATMENT

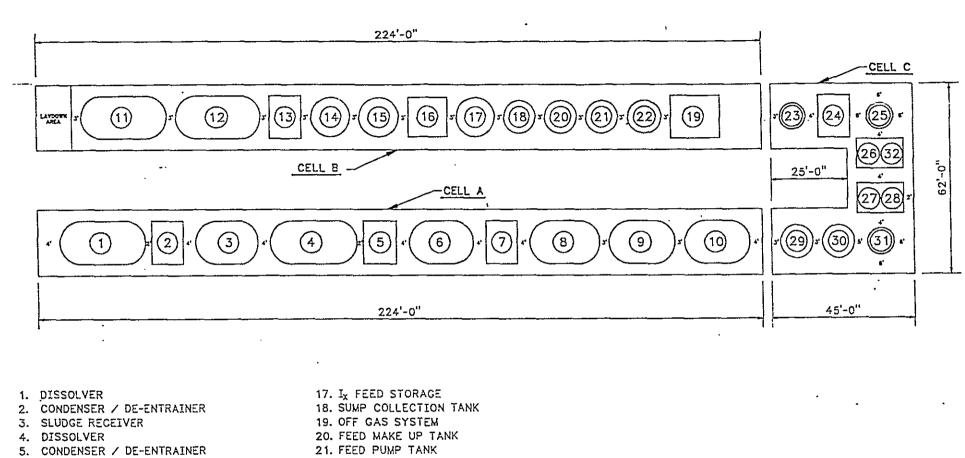
FACILITY

ELEVATION B 1 ===



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4. DISSOLVER
5. CONDENSER / DE-ENTRAINER
6. SLUDGE RECEIVER
7. NO_X TOWERS
8. RECOVERED NITRIC
9. SUPERNATE FEED / RECEIVER
10. SUPERNATE FEED / RECEIVER
11. LOW LEVEL WASTE
12. LOW LEVEL WASTE
13. C_S STORAGE/CONCENTRATORS/PROD RECIEVER
14. I_X PRODUCT RECEIVER
15. I_X ELUANT RECYCLE
16. I_X COLUMN I_X PUMP TANK WASTE RECEIVER

19. OFF GAS SYSTEM
20. FEED MAKE UP TANK
21. FEED PUMP TANK
22. WASTE RECEIVER
23. SOLVENT FEED TANK
24. CONTACTORS
25. SOLVENT WASH
26. SOLVENT STORAGE
27. TRU PRODUCT
28. TRU CONCENTRATOR
29. CONCENTRATED TRU RECEIVER
30. CONCENTRATED TRU RECEIVER
31. CONDENSATE RECEIVER
32. REGENERATION WASTE TANK

NOT APPROVED FOR CONSTRUCTION

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PRE-TREATMENT

CELL EOPT LAYOUT

HOW PRE-TREATMENT ASSURE

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SUPERMITE RECEIVER TANKS LOCATED OUTSIDE BESLIDGE PRELIMINARY PLAN A HWVP PRE-TREATMENT BLDG MODIFICATIONS

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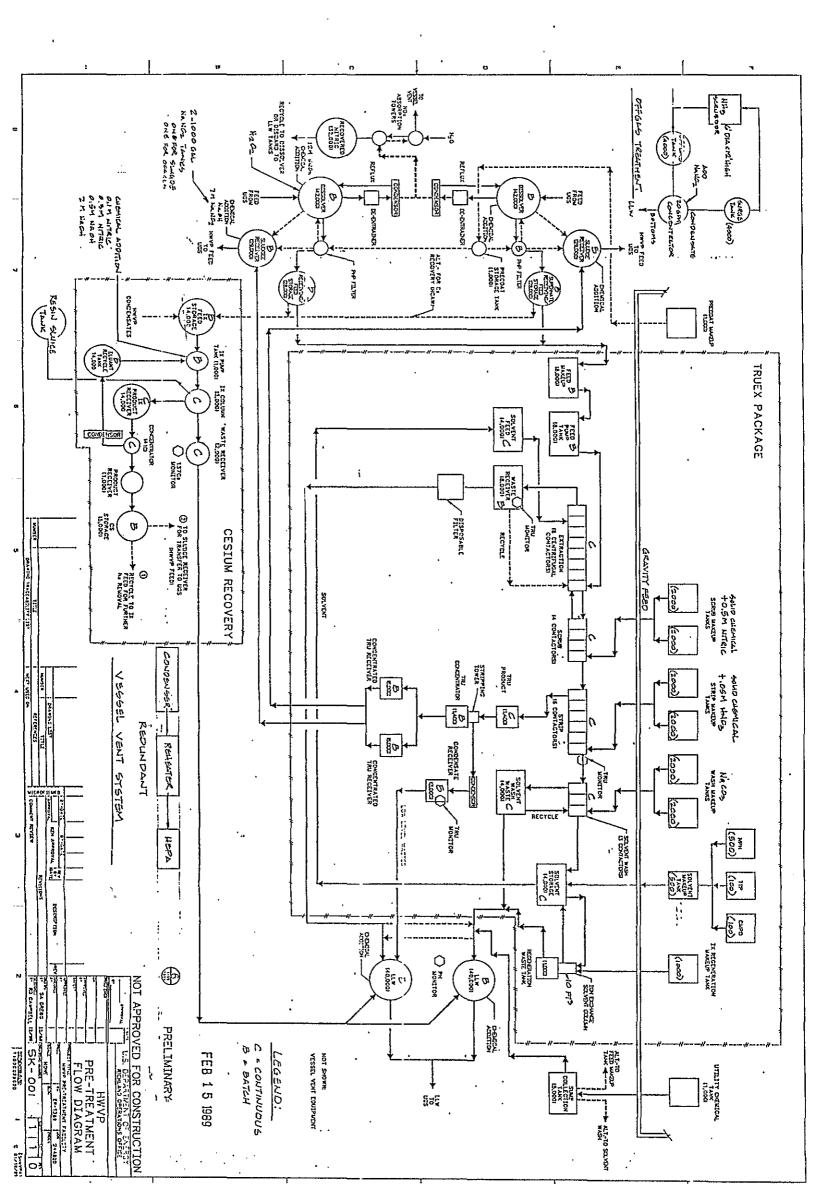
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APPENDIX E

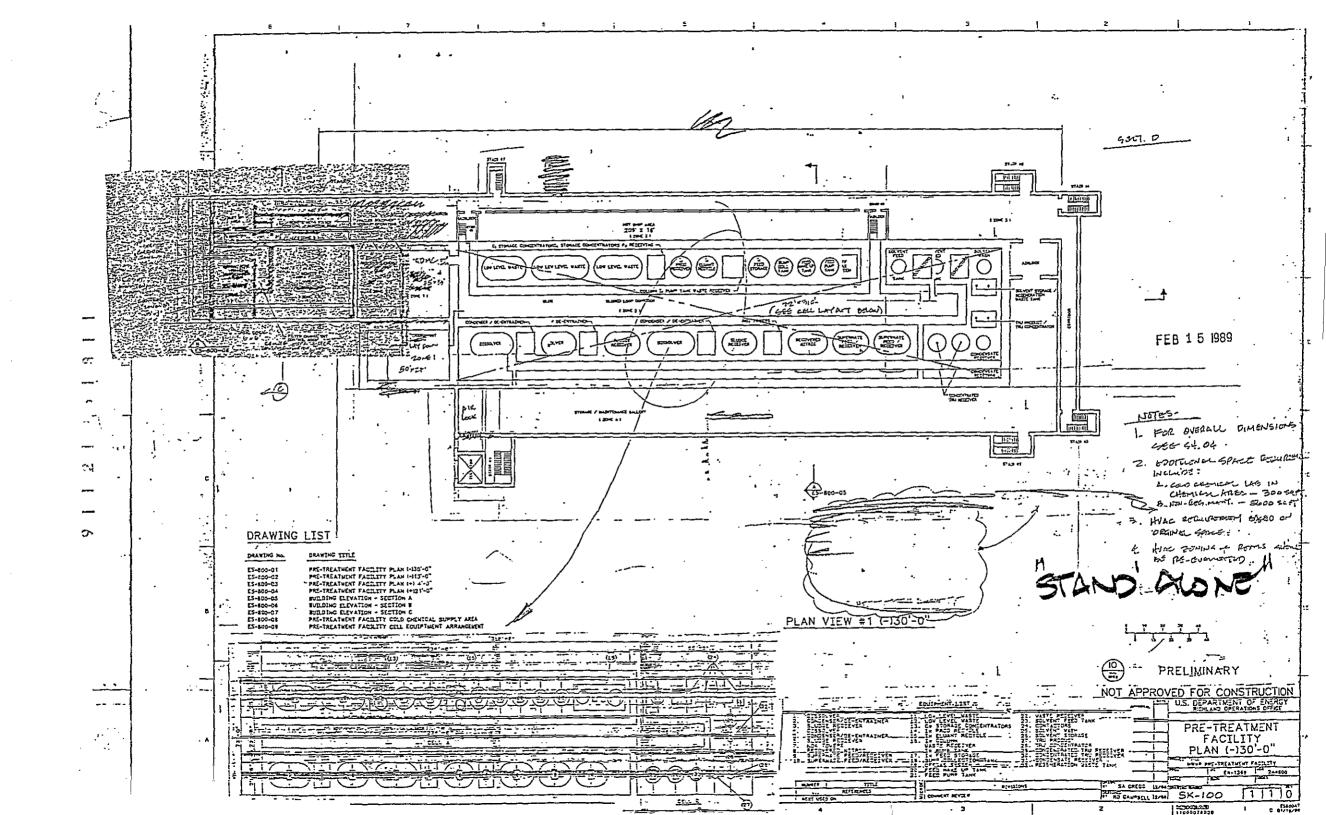
UPDATED FLOW DIAGRAM

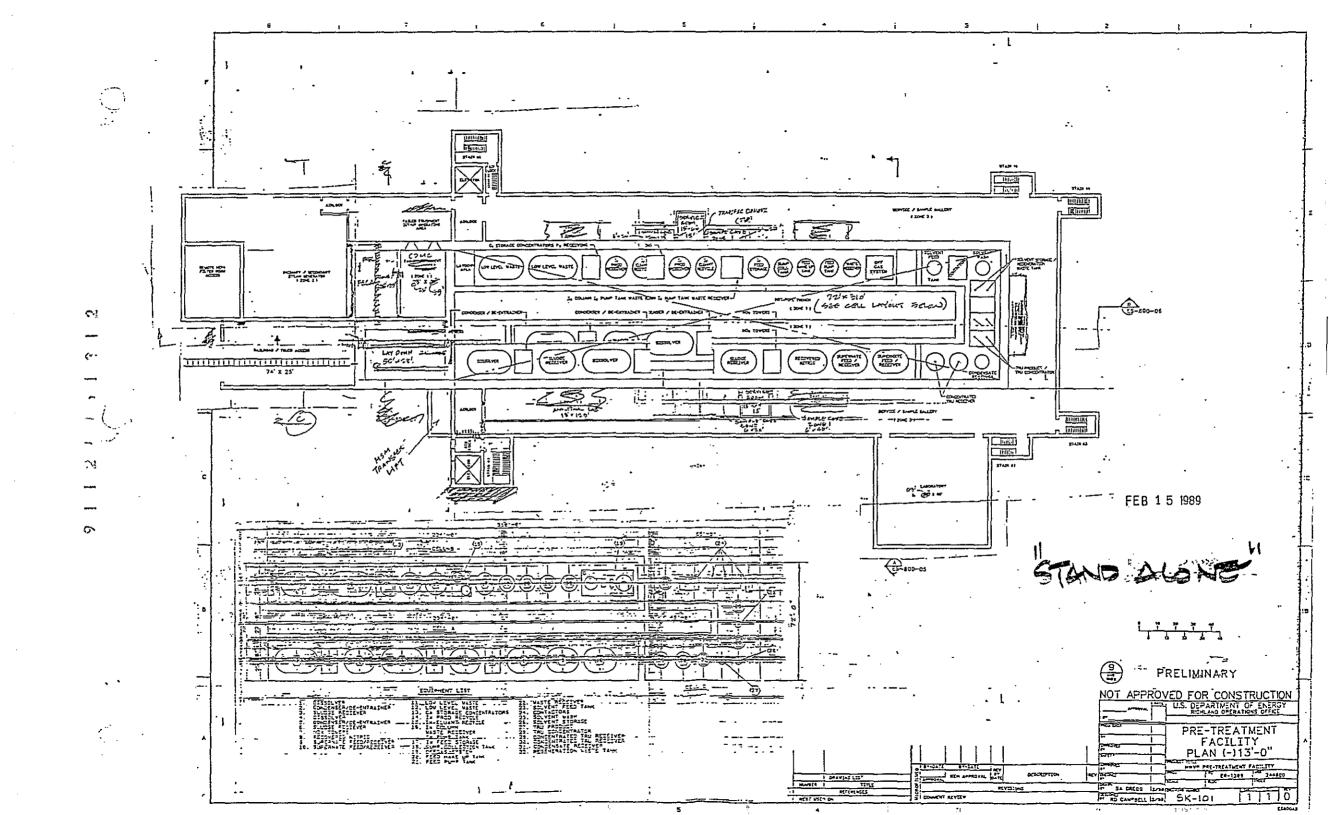


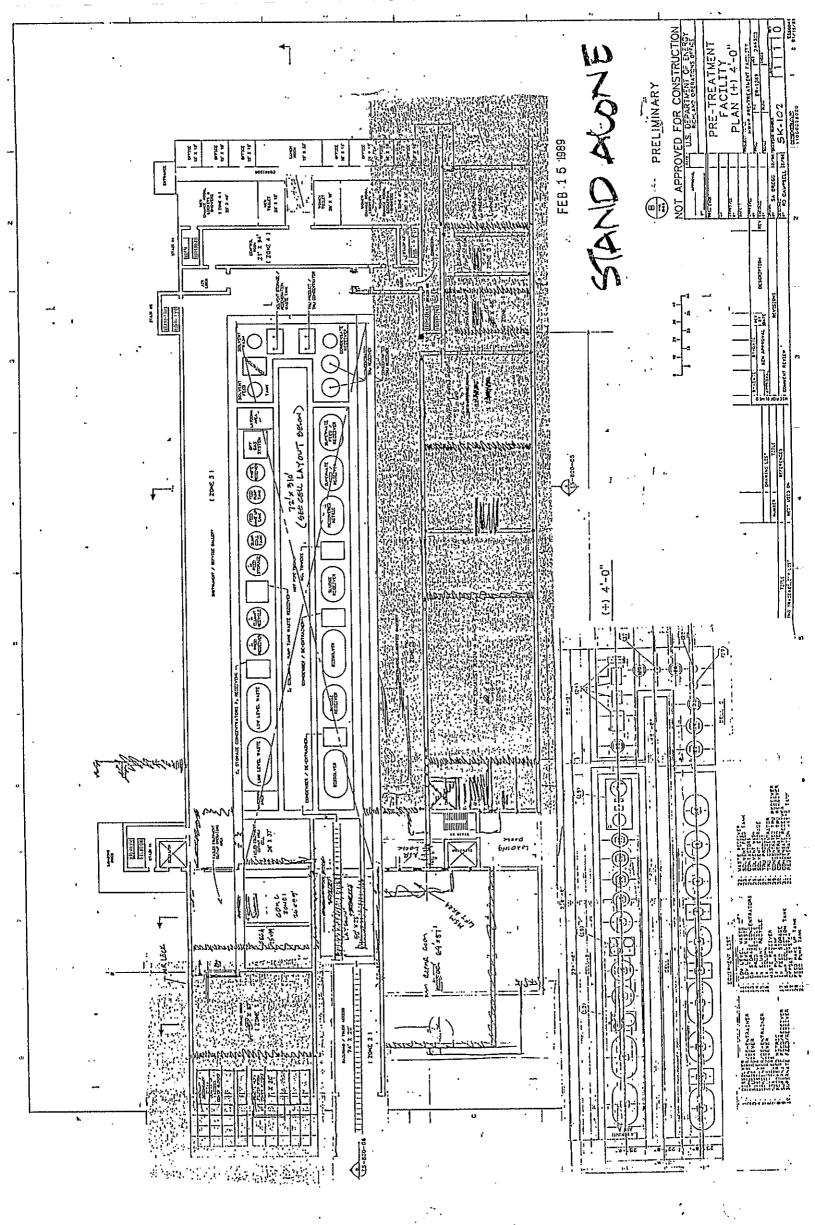
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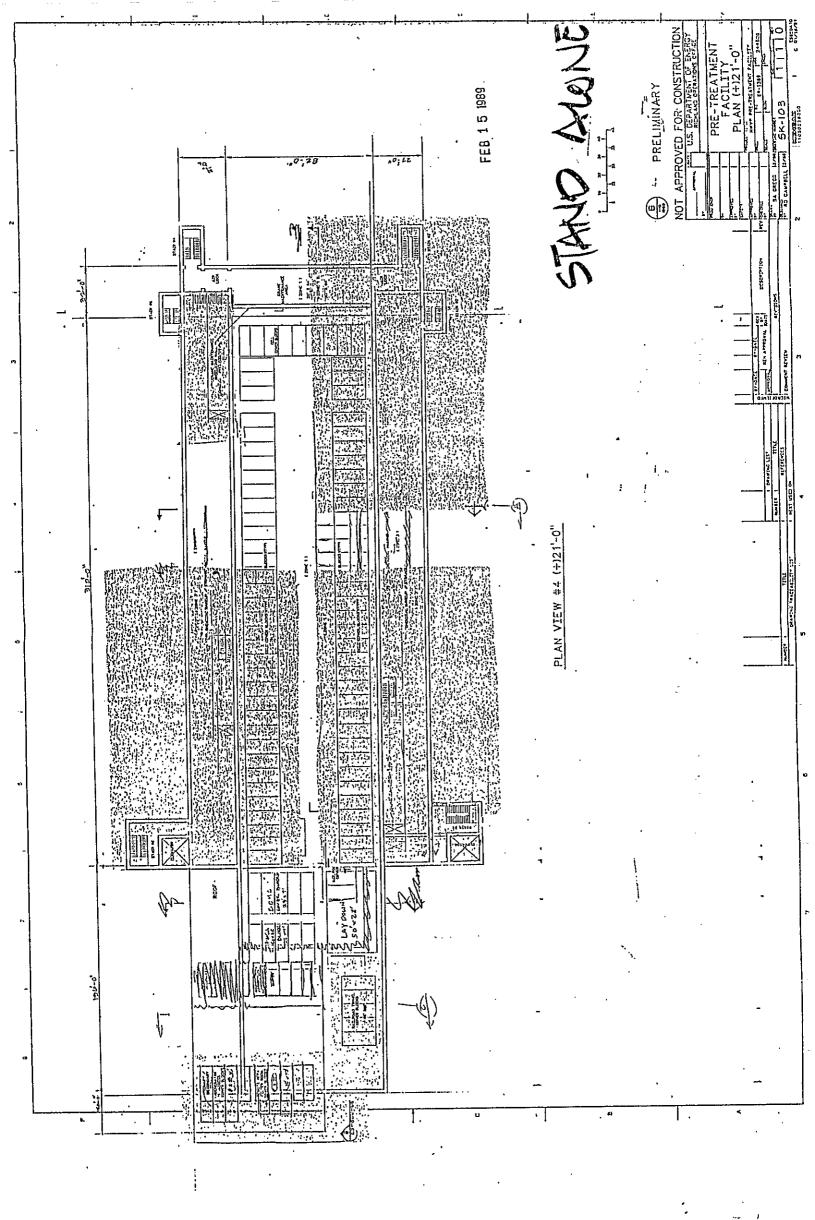
APPENDIX F

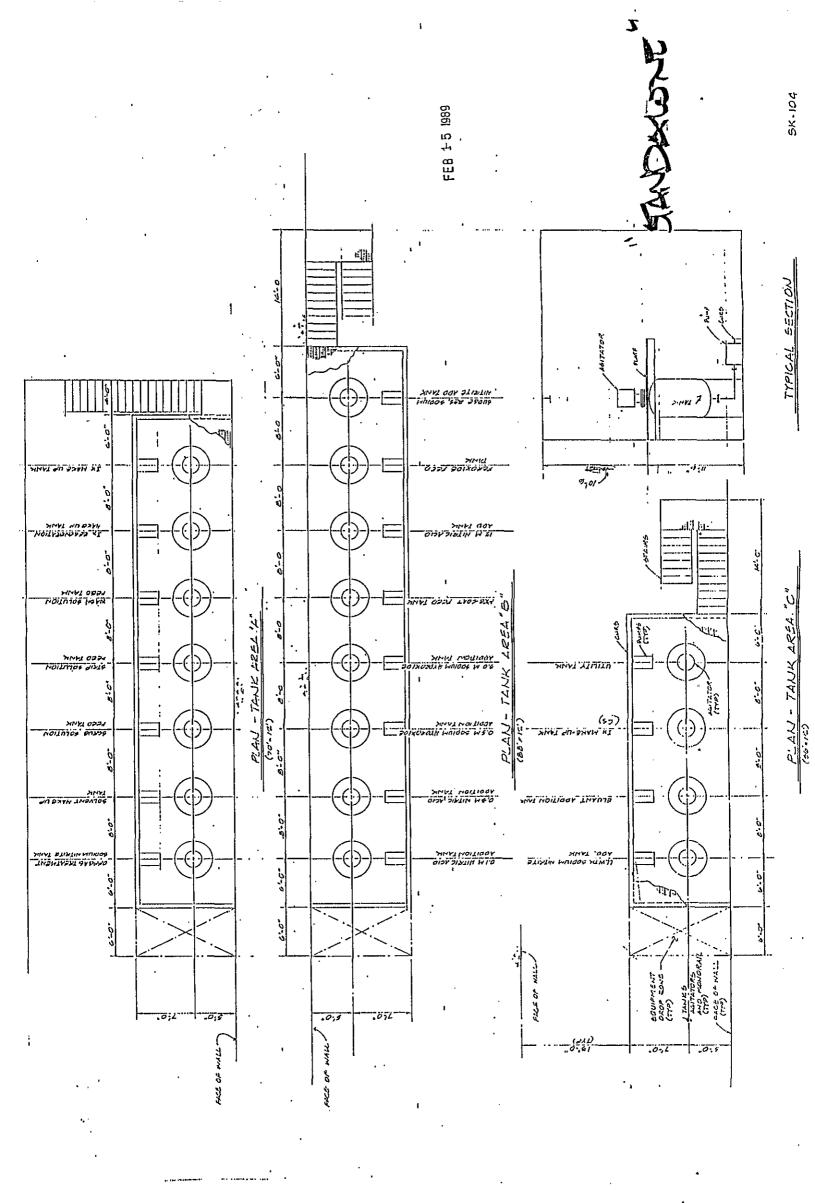
FACILITY DRAWINGS STAND-ALONE ALTERNATIVE

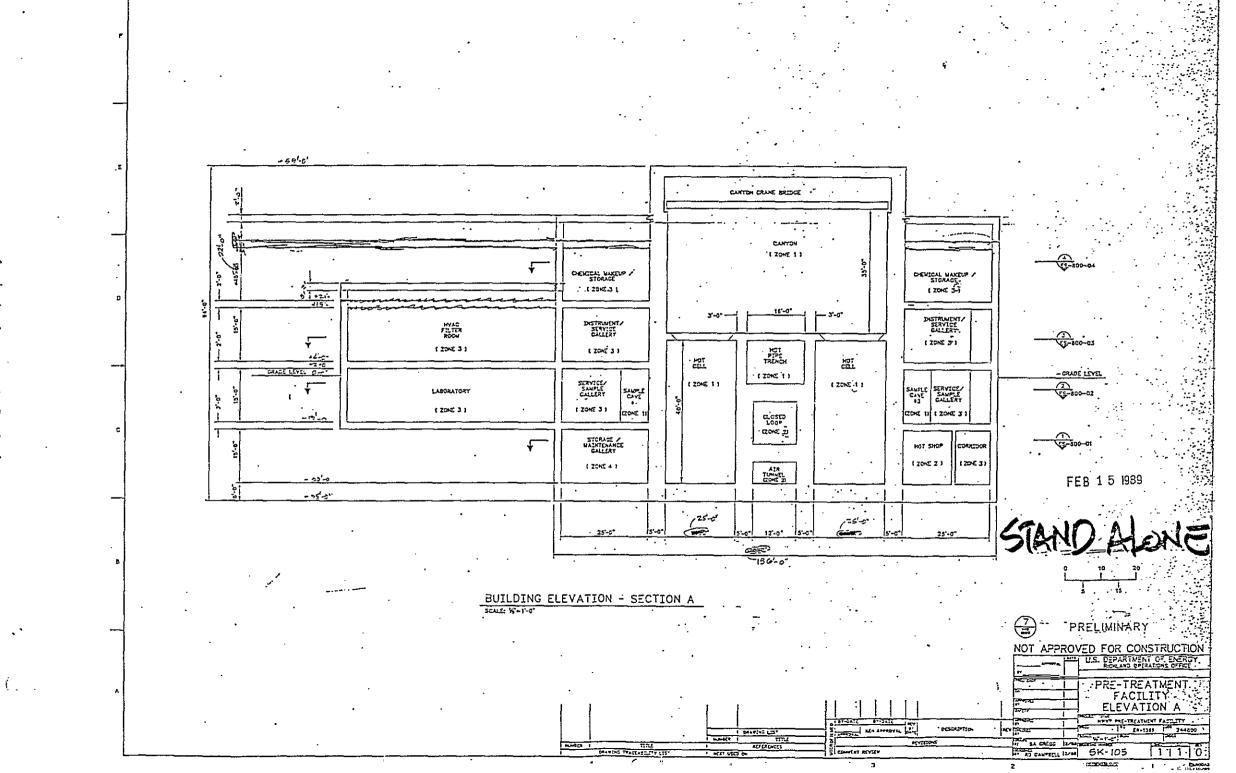


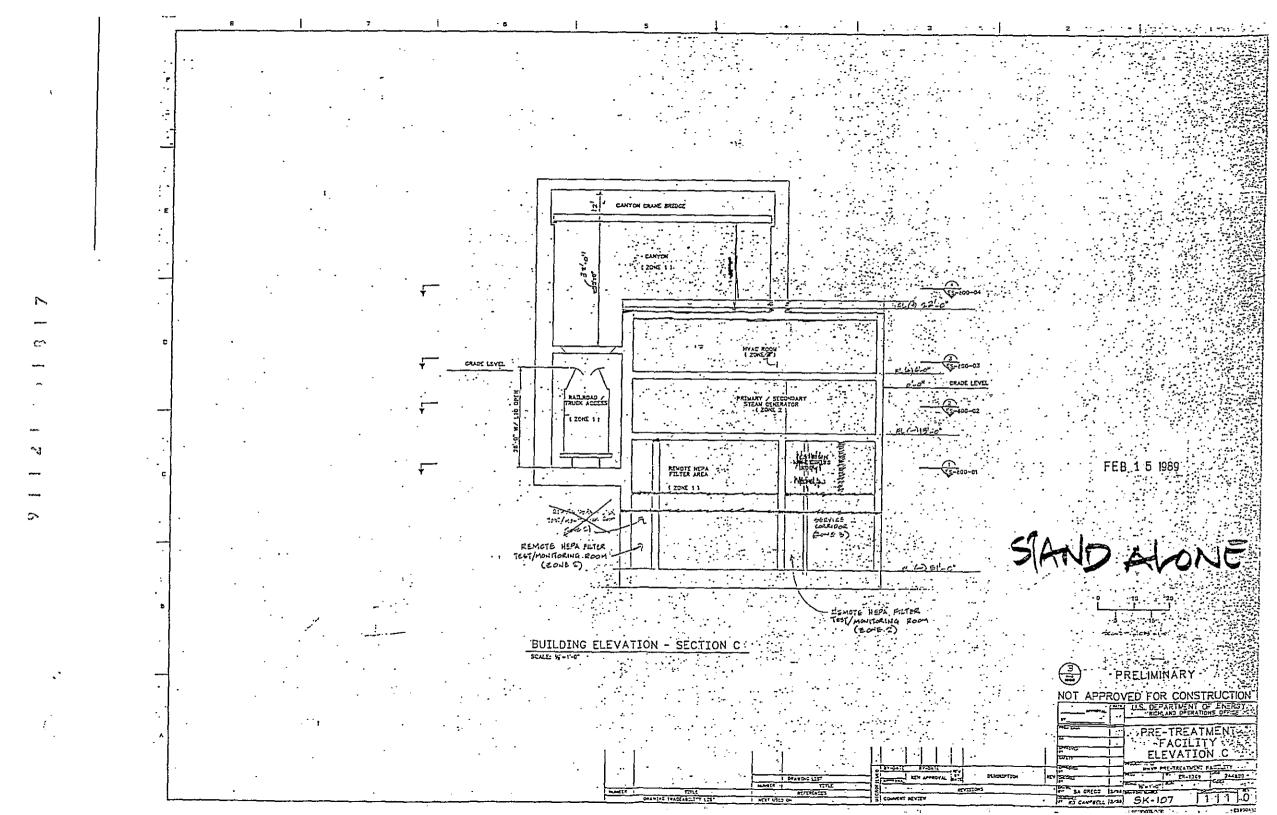


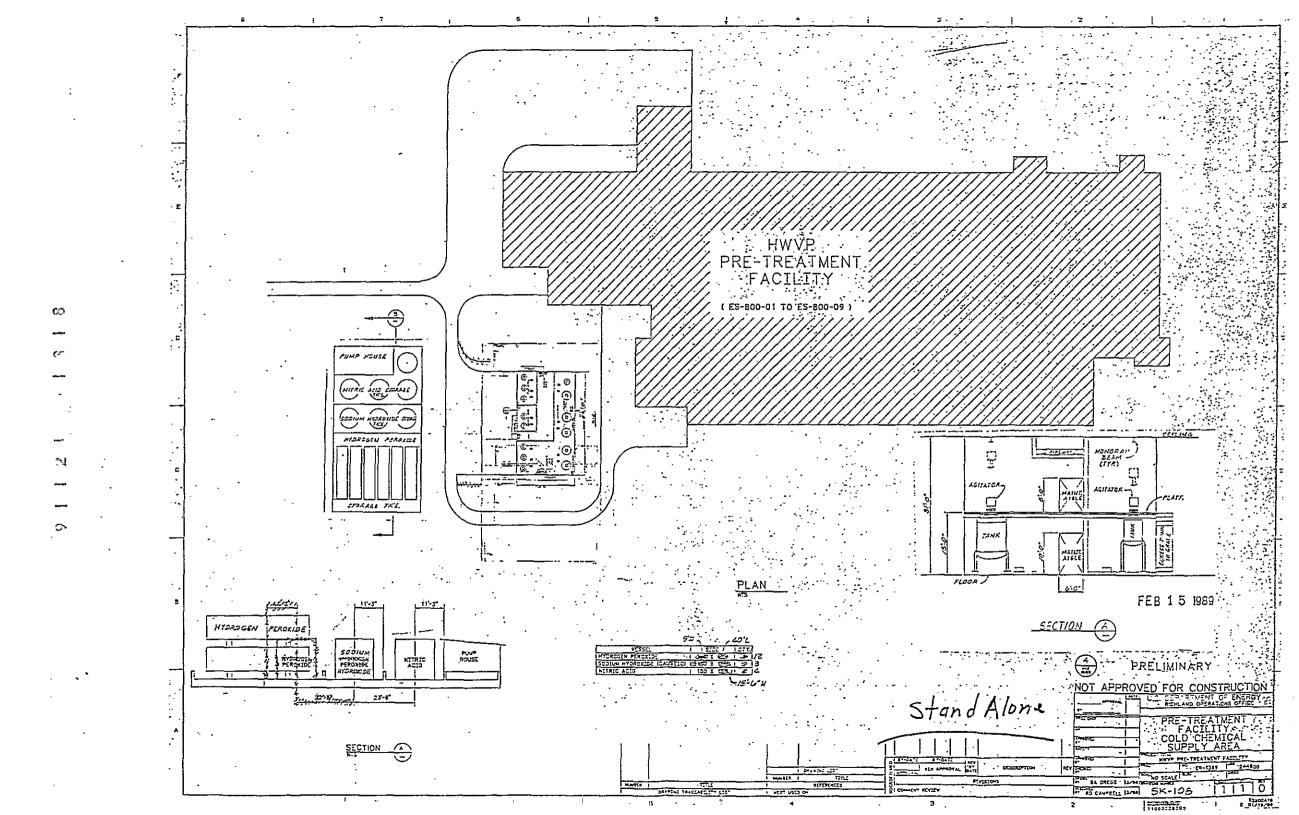






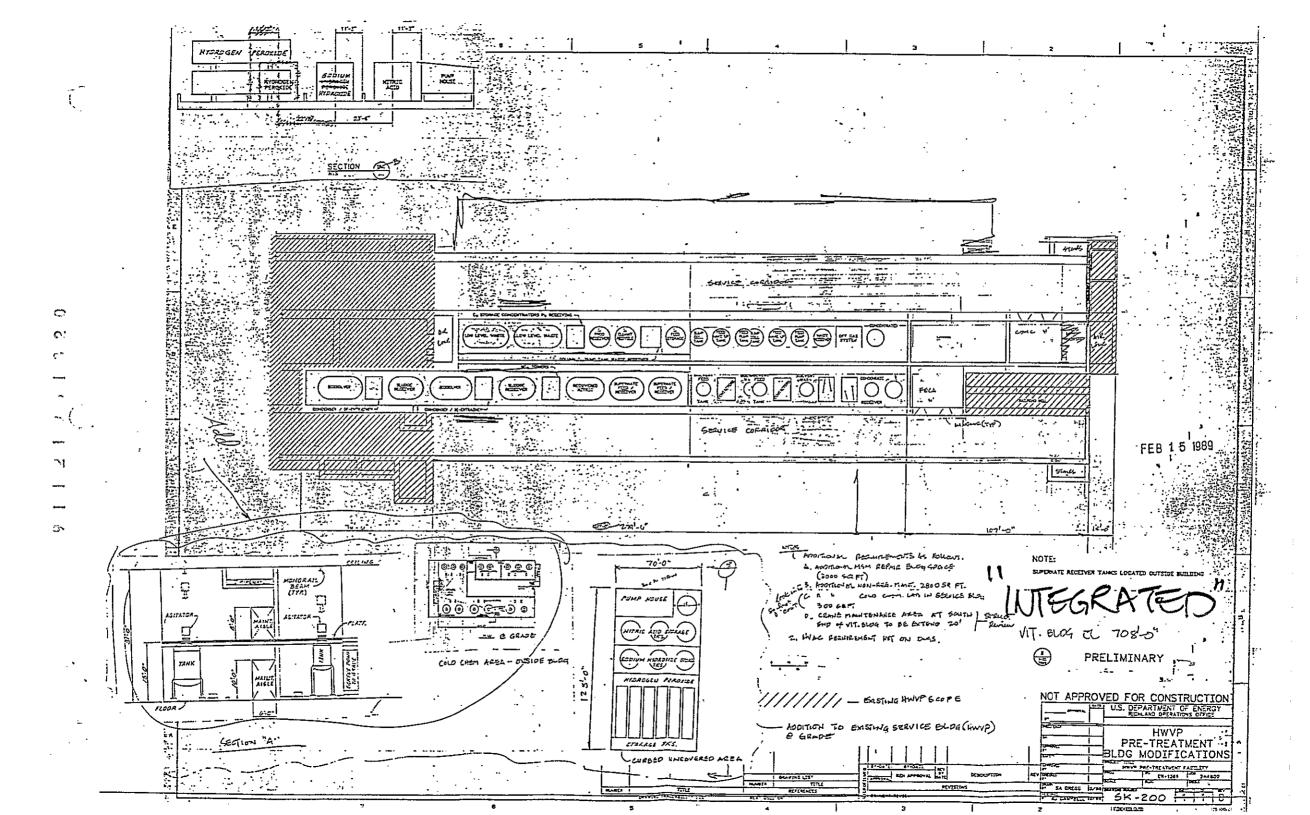






APPENDIX G

FRCILITY DRAWINGS INTEGRATED ALTERNATIVE



FEB 1 5 1989 NOTE: SUPERHATE RECEIVER TAKKS LOCATED OUTSIDE BUILDING INTEGRATE" PRELIMINARY PLAN A NOT APPROVED FOR CONSTRUCTION

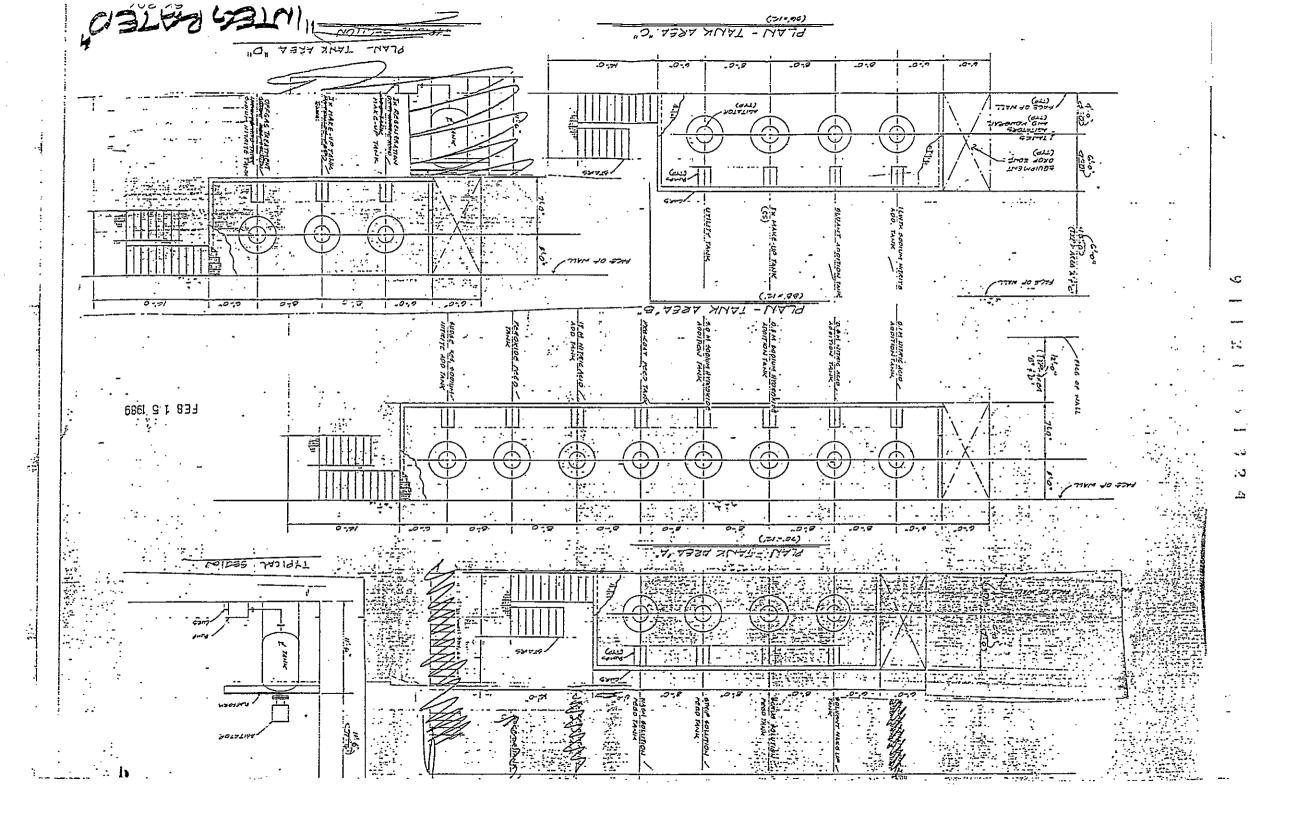
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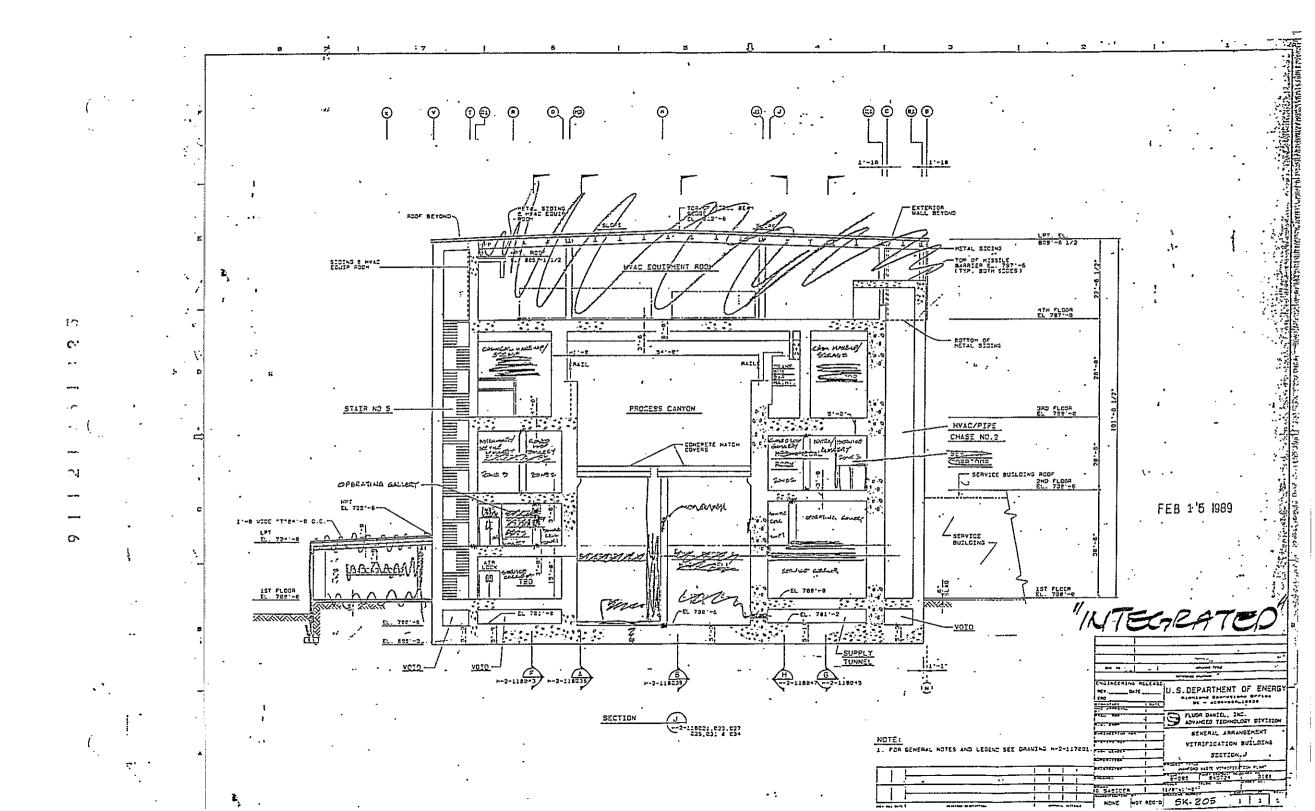
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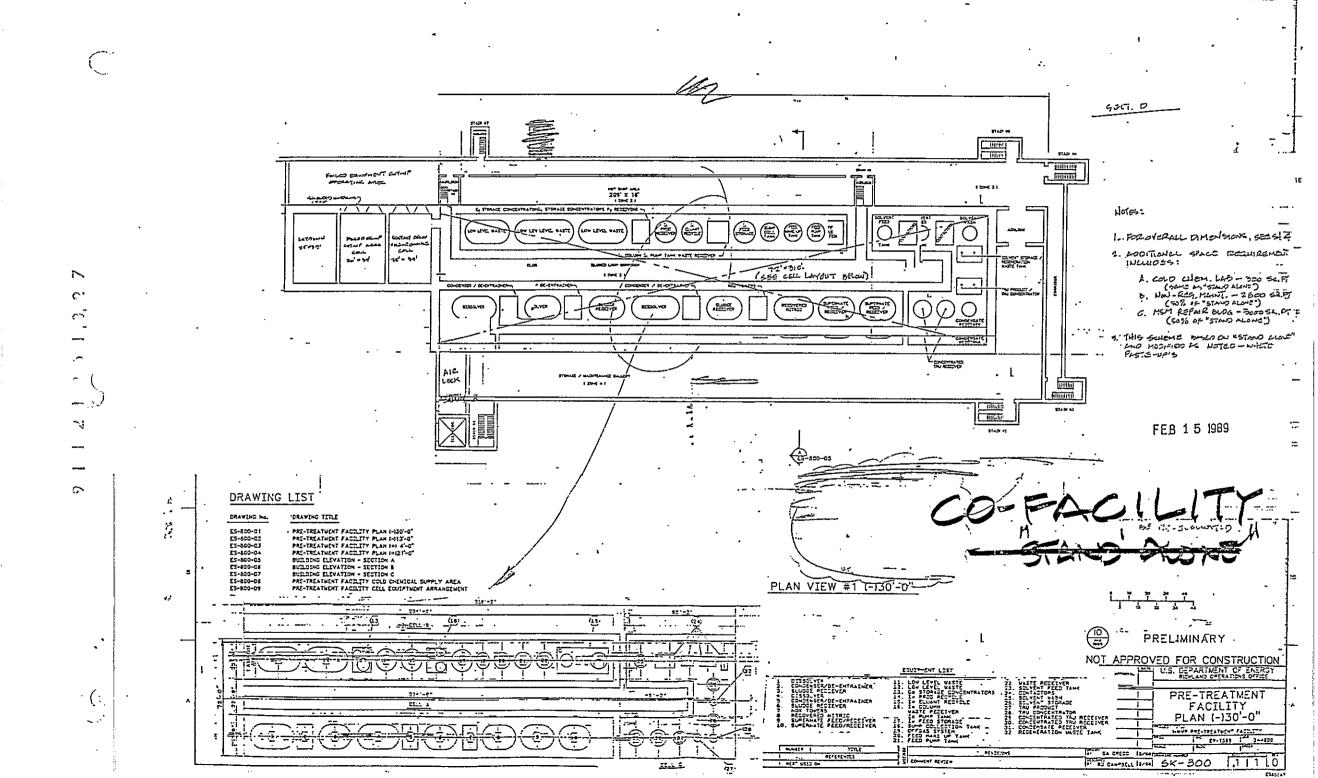
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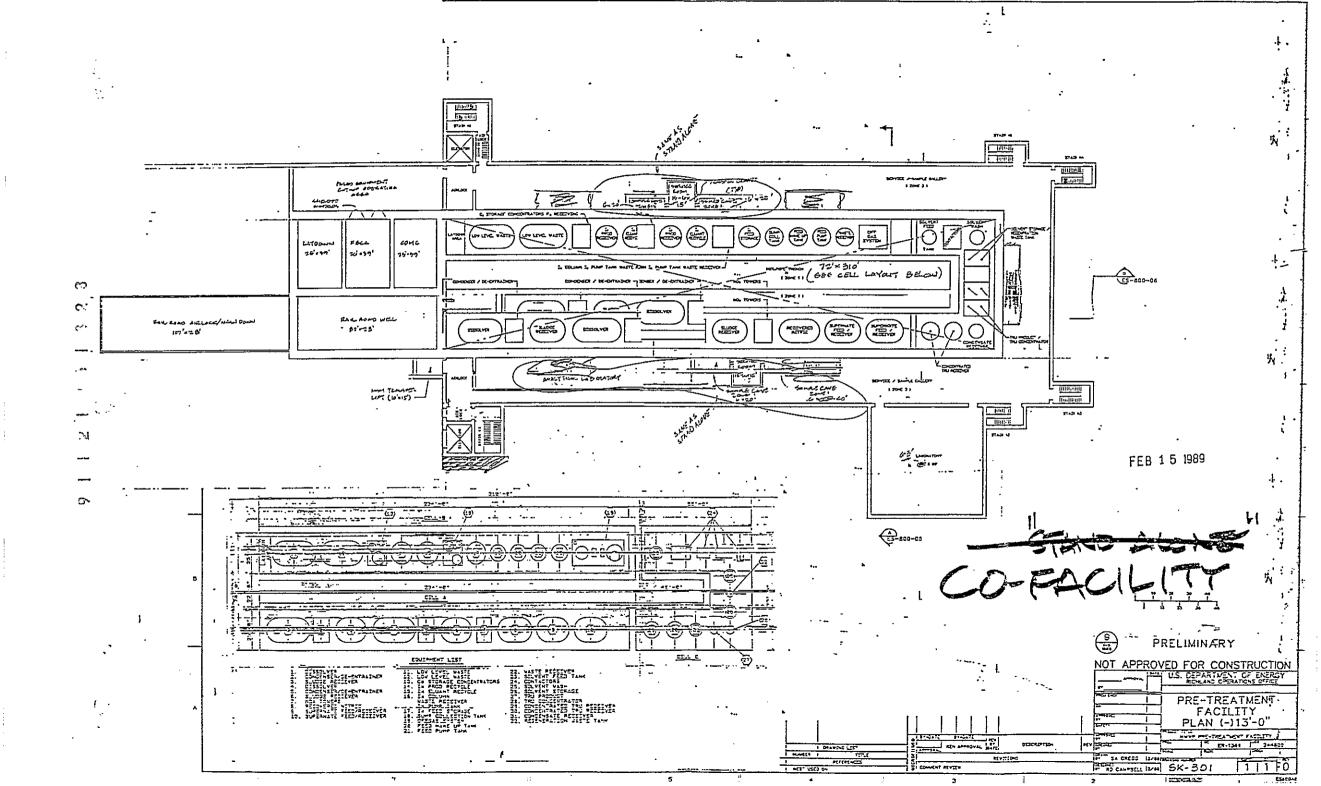


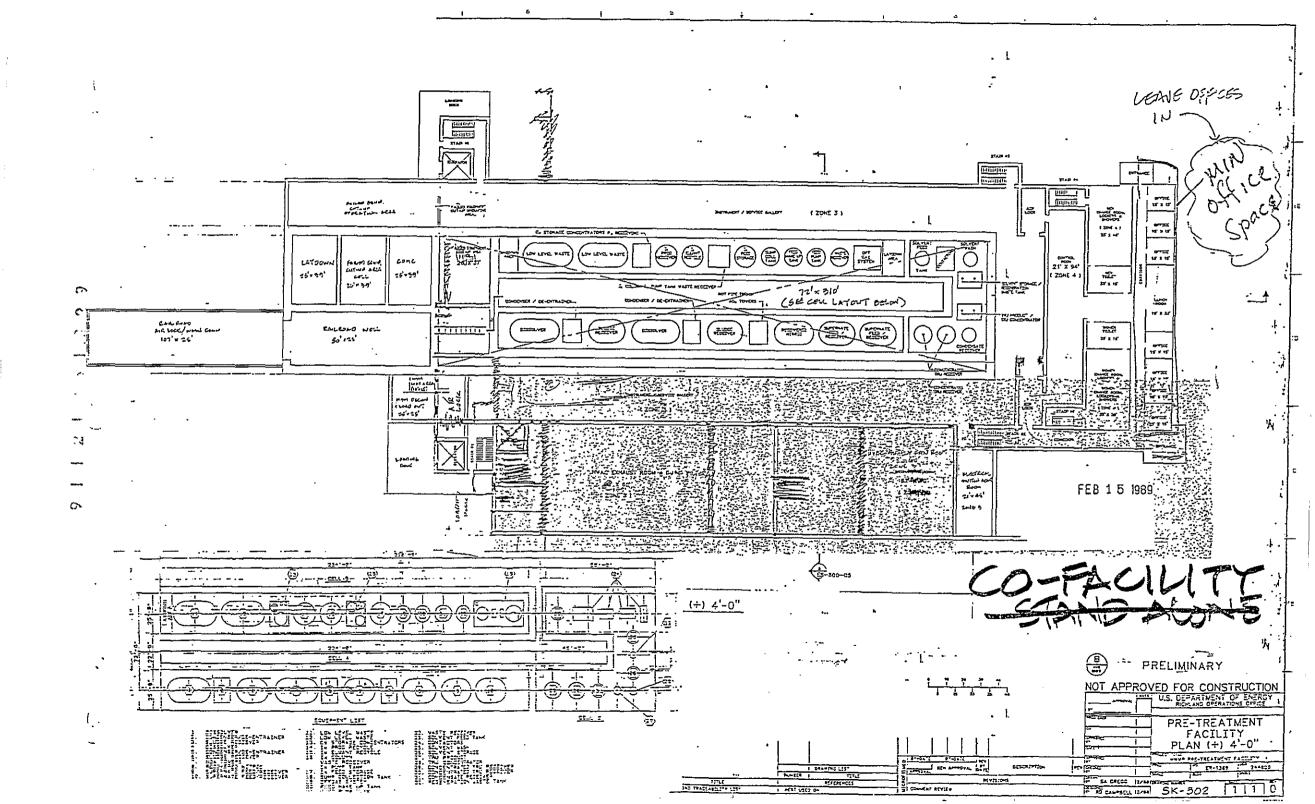


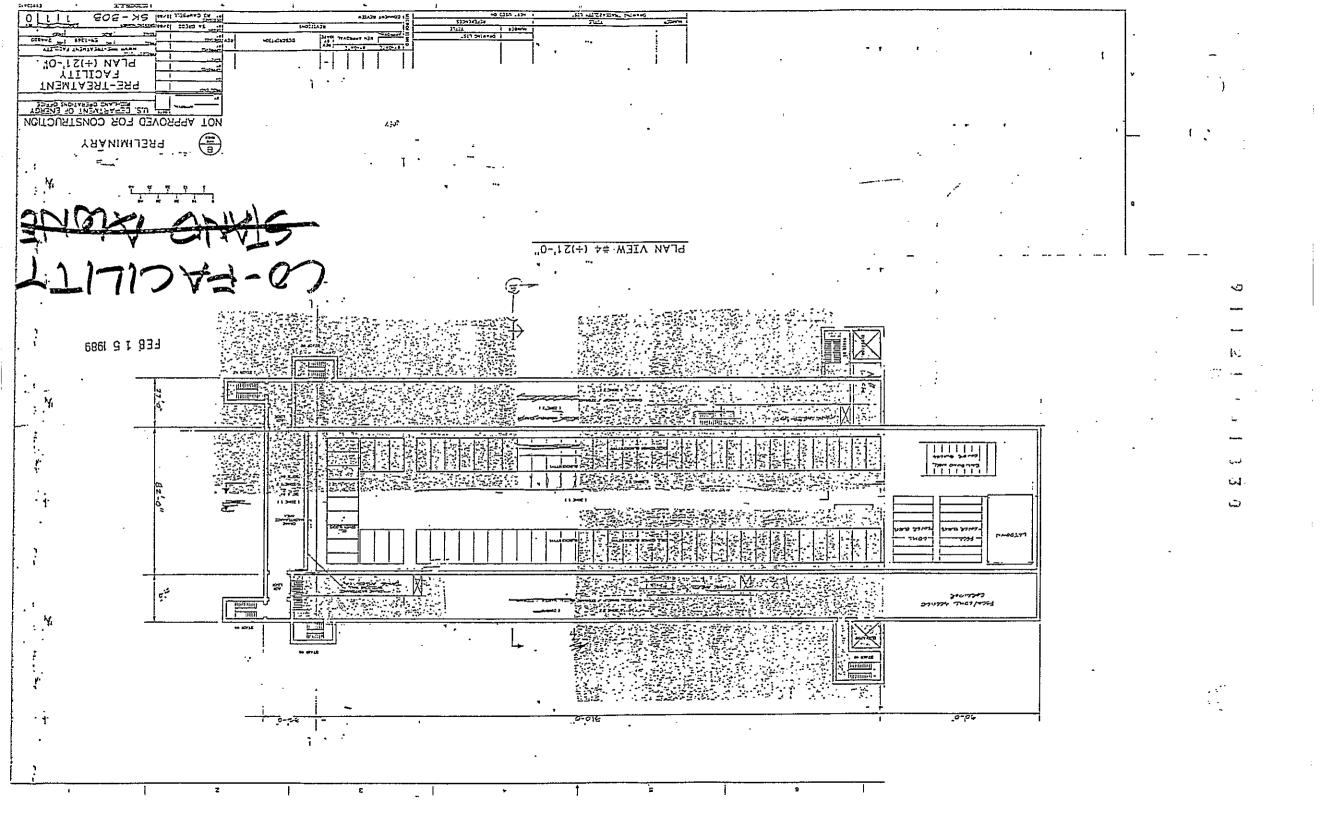
APPENDIX H

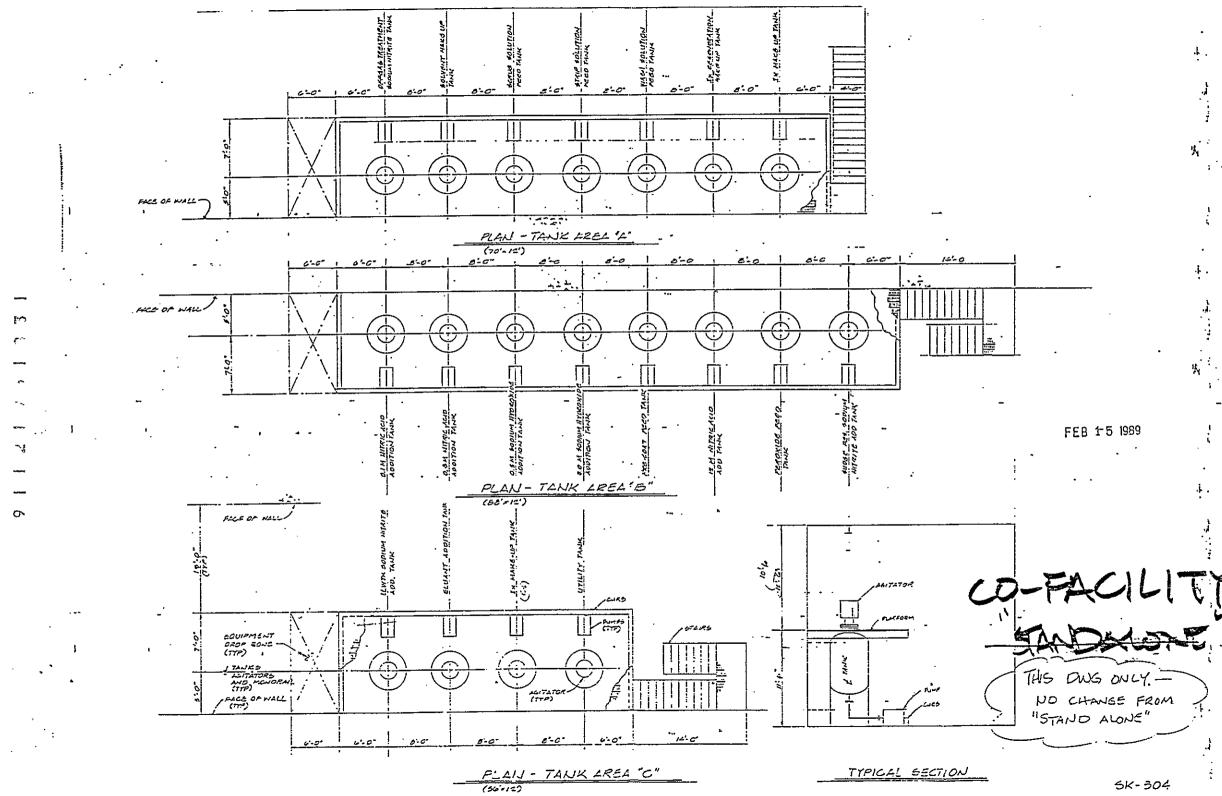
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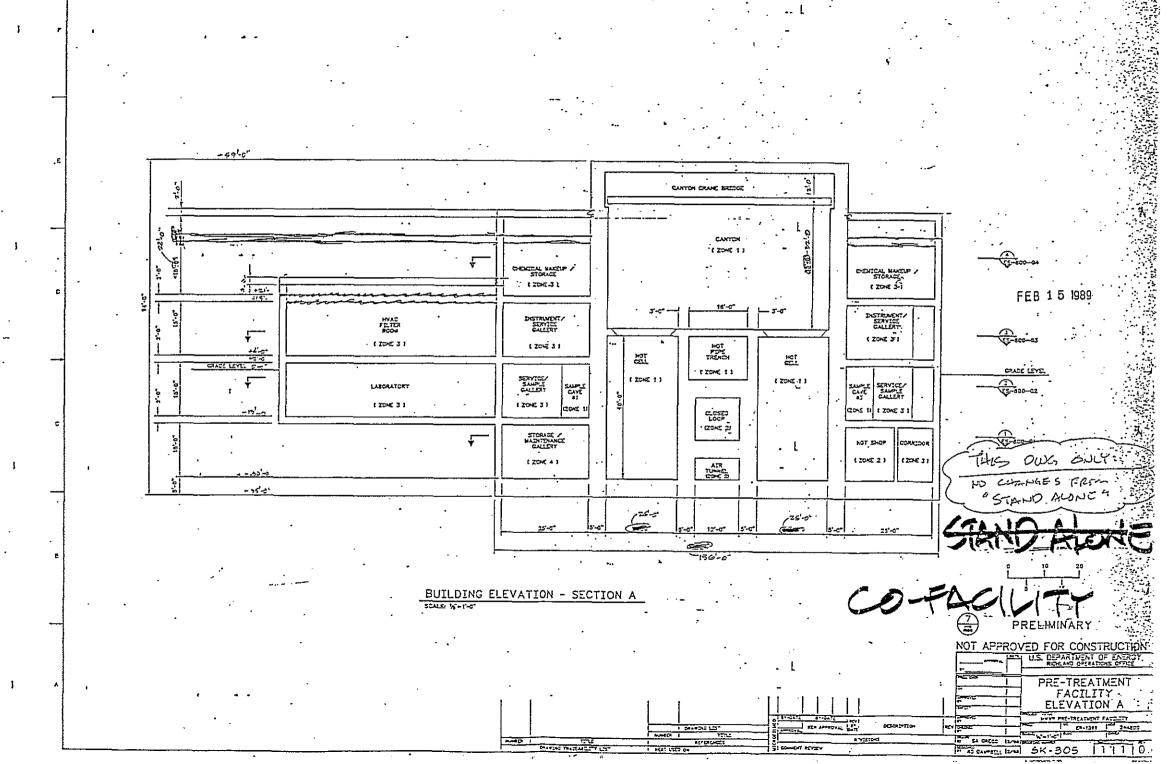






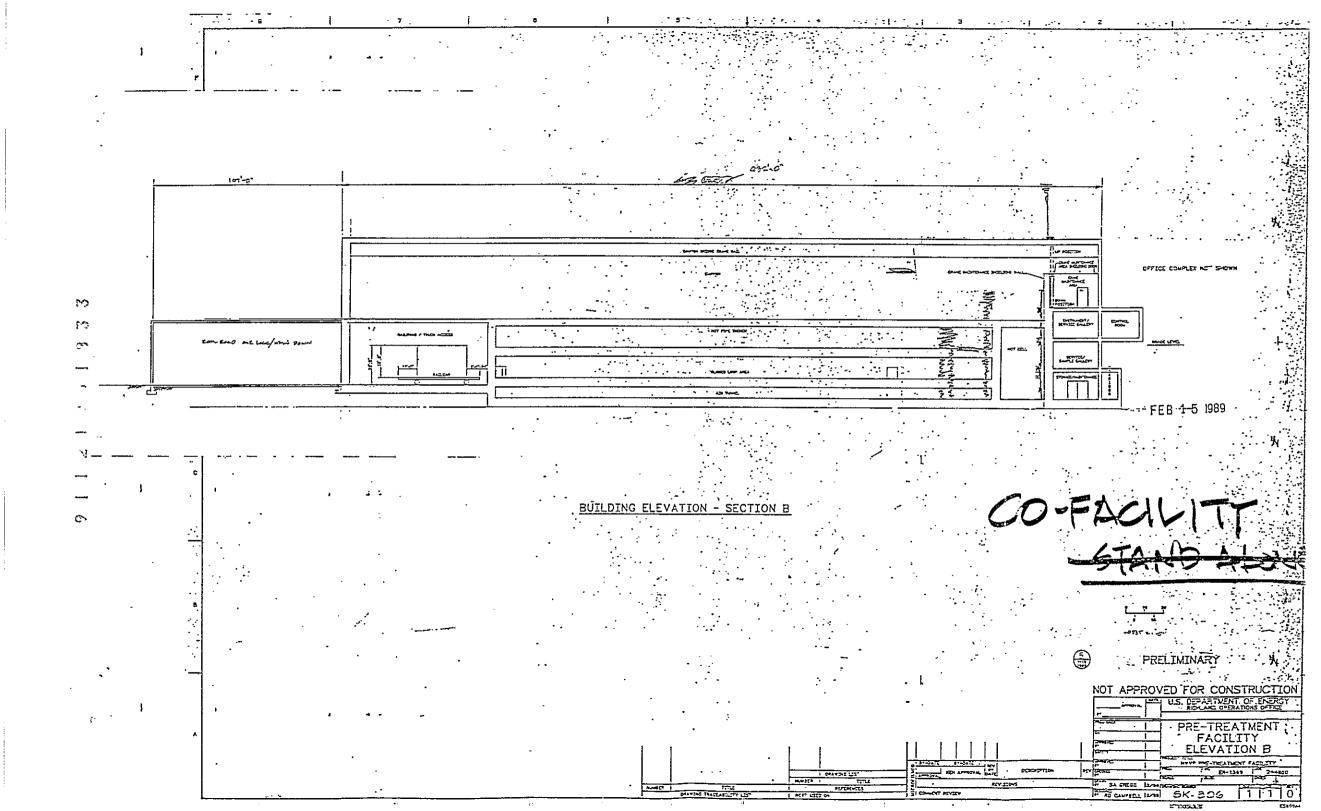


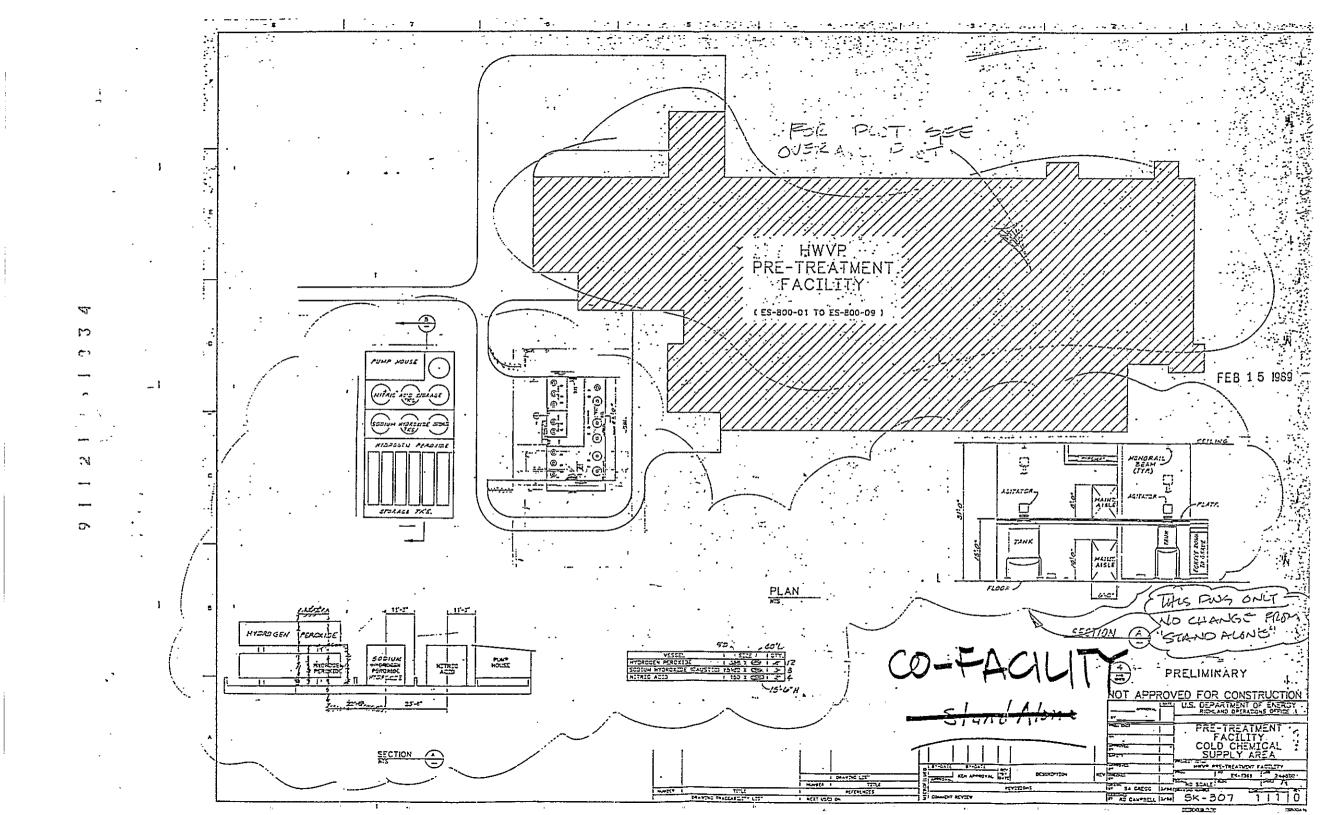




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ATTACHMENT 2

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Fluor Daniel Inc. 3333 Michelson Crive III. 14 04 92730 17141 975-2000

March 3, 1989

Westinghouse Hanford Company P.O. Box 1970 Richland, Washington 99352

Attn: Mr. R. P. Anantatmula

Gentlemen:

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Rough Order of Magnitude (ROM) Cost Study
for WHC Stand-Alone Alternative

Reference: Pre-Treatment Cost Studies, dated February 22, 1989

As requested by WHC on February 24, 1989, Fluor Daniel has prepared a ROM cost study for the Stand-Alone Facility (enclosed), based on the WHC provided drawings. It is important to make the following observations regarding the attached ROM estimate:

- The ROM estimate was prepared over a two day time period by applying factors from the Stand-Alone estimate (reference). In order to respond in the required time frame, the estimating technique used factors which were applied to allowances and/or areas that were originally factored. An estimate produced in this manner should be used with caution.
- 2) As noted in the referenced cost studies, Fluor Daniel had strong reservations regarding the viability of the facility depicted on the drawings provided by WHC. Examples of the reservations were the absence of chiller rooms for the HVAC and the absence of adequate lay down and maintenance areas. In fact, it was these types of concerns that led to the development of the stand-alone estimate presented in the referenced report.
- 3) The estimate is subject to the estimate bases and limitations described in Section 3.0 of the enclosed cost study.



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Mr. R. P. Anantatmula Westinghouse Hanford Company Richland, Washington 99352

March 3, 1989

If you have any questions regarding the enclosed information, please contact Jon Smets at (714) 975-5120 or Chuck Guenther at (714) 975-5773.

Sincerely,

R. N. Gibbons

Project Manager

RNG: CDG: nmd Enclosures



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Cost Study

Process and Facility Options for Pre-Treatment of Hanford Tank Wastes

Stand-Alone Concept (WHC Concept)

March 1989

Fluor Daniel Inc.
Advanced Technology Division
Irvine, California



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3.0	Basis and Assumption	3
4.0	TEC Estimate	9



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References

 Cost Studies - Process and Facility Options for Pre-Treatment of Hanford Tank Wastes, dated February, 1989, - by Fluor Daniel Inc.



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1.0 Introduction

Fluor Daniel was requested to prepare cost studies for three pre-treatment alternatives by Westinghouse Hanford Company (WHC). The cost studies were provided via a report titled, Cost Studies - Process and Facility Options for Pre-Treatment of Hanford Tank Wastes, dated, February, 1989. A "stand-alone" concept was included in the above study based on a concept developed by WHC. Fluor Daniel was requested to review the original concept and incorporate the necessary modifications in conjunction with WHC. The modifications included such items as additional contact and remote maintenance and laydown areas, addition of a chiller room for the HVAC, expanded HVAC equipment rooms, addition of an off-gas system, and expansion of the cold chemical storage area. The extent of these modifications are discussed in the referenced report.

During the course of the development of the cost studies,
WHC requested that Fluor Daniel develop a ROM cost for the
"stand-alone" pre-treatment facility as originally submitted
by WHC. This cost study would be utilized to compare other
alternatives on a common basis. Fluor Daniel responded to
the request by providing a ROM cost study which was
prepared over a two day time period from the previously
developed data, and the results are included herein.



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2.0 Description

A cost study for the "original" WHC stand-alone pre-treatment facility was based on the drawings included as Appendix 1. The ROM estimate utilized data developed for the stand-alone pre-treatment facility submitted in the reference (Ref. 1). The estimate basis and qualifications are described in Section 3.0 of this report.



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3.0 Basis and Assumptions

3.1 General Basis

The direct costs for the stand-alone pre-treatment facility were estimated using the following methods:

- o Allowances from the HWVP Reference Conceptual Design (RCD) Rev. 1 estimate.
- o MTO using unit rates of installation derived from the RCD Rev. 1 estimate, expressed in 1988 dollars.
- o Equipment factored estimates using equipment cost to direct installed costs based on ratios (factors) derived from the RCD Rev. 1 estimate.

Engineering/Design and engineering and inspection during construction, construction and project management costs were estimated as percentages of direct costs based on indirect to direct cost relationships in the RCD Rev. 1 estimate.

All costs were estimated in GFY 1988 dollars and escalated by 4.35% to GFY 1989 (as requested by WHC) to achieve compatibility with the KEH estimate of the facility. The basis for escalation is Kaiser's table KEHRII dated 2/22/89, using February 1989 as the base date.

The schedule utilized for escalation was the same schedule used for the stand-alone pre-treatment facility included in the referenced cost study.

The contingency evaluation was based on the contingency analysis used for the stand-alone pre-treatment facility included in the referenced cost study. It is the opinion of



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Fluor Daniel, that the contingency calculated in this manner may not be consistent with the estimating techniques used to develop the estimate. A detailed contingency analysis should be performed for this estimate if this pre-treatment alternative becomes viable.

The "original" WHC drawings are included as Attachment 1.

All costs are Total Estimated Costs (TEC). Expense funded costs such as Research and Development and Conceptual Design are not included. Life cycle costs have not been estimated.

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3.2 Specific Basis

Direct Cost Category	1988 \$ x 1,000	EST'G <u>Method</u>	Remarks
Temp Const	2,500	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT pre-treatment facility estimate. (\$2,500M is approximately 80% of RCD Rev. 1 estimate of temp const.)
Site Prep	935	Allowance	Allowance from Fluor's "Stand-Alone" 212,000 FT ² facility estimate. Includes security fence/lighting/roads & site clearance based on 175,000 FT ² facility footprint. (Unit rates from RCD Rev. 1 estimate)
Structures	50,329	мто	ROM, MTO based on WHC furnished 175,000 FT facility dwgs (175,000 FT facility). This category includes sitework, concrete, structural steel, cell lining, & architectural costs.
Fire Prot. & Det.	2,000	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT estimate. (allowance of double RCD Rev. 1 Vit Bldg cost for this category)
HVAC	10,000	ROM Allowance	Factored from Fluor's "Stand-Alone" 212,000 FT ² estimate: HVAC Cost for the $\left(\frac{\text{VOL } 175,000 \text{ FT}^2}{\text{VOL } 212,000 \text{ FT}^2} \frac{\text{FAC}}{\text{FAC}}\right)^{.6}$
In-Cell Pipe	12,278	Various	This cost category includes the following items: o embedded pipe o hot pipe trench o in-cell jumpers

Direct Cost Category	1988 \$ x 1, 000	EST'G <u>Method</u>	Remarks
			The unit costs for the above items are from Fluor's "Stand-Alone" 212,000 FT facility adjusted to the 175,000 FT facility by the following methods:
			o embedded pipe & hot pipe trench:
			212,000 FT ² Cost 30 in-cell tanks x 39 in-cell tanks
			o in-cell jumpers:
			600 jumpers (furnished by WHC) x direct cost per jumper derived from the RCD Rev. 1 estimate.
Electrical Supply	1,593	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est.
Electrical Distribution	5,720	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est.
Process Utilities	18,159	Allowance :	Same allowance as Fluor's "Stand-Alone" 212,000 FT est. (Capacity factored HWVP RCD Rev. 1: utility system estimate.)
DCS	12,896	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT" est. (Equipment factored estimate based on HWVP DCS equipment cost to installed direct cost ratios.)

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Direct Cost Category	1988 \$ x 1,000	EST'G <u>Method</u>	<u>Remarks</u>
HP System	10,560	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est. (Equipment factored estimate based on HWVP HP equipment cost to installed direct cost ratios.)
Communications	250	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT facility estimate. (Allowance from HWVP Vit Bldg Estimate.)
Remote Handling, Sampling Analytical Maint Repair. This cost category includes:	18,296 Fac	Equipment tored Estimate	The equipment included in this category was not included with in the WHC data received & by Fluor. Based on the Fluor "Stand-Alone" 212,000 FT facility estimate equipment list, Fluor coordinated with WHC as to which pieces
o Regulated, Non- Regulated & MSM Repair			or quantities of equipment to include in the WHC 175,000 FT "Stand-Alone" facility estimate. The marked up equipment list is included as Appendix 2. Equipment was factored to installed direct costs by
o Equipment decon, Repair and Maintenance			applying the same factors used in Fluor's "Stand-Alone" 212,000 FT" facility estimate.
o Process Sampling	ī		
o Analytical			
o Remote Handling Equipment		,	*. *·
In-Cell Equipment	37,779	Equipment Factored Estimate	The Fluor "Stand-Alone" 212,000 FT ² facility equipment list (see Appendix 2) was adjusted to conform to the equipment list furnished to Fluor by WHC see Appendix 2. The resultant total equipment cost was factored to installed direct costs by applying the same factor used in Fluor's "Stand-Alone" 212,000 FT ² facility estimate.

Direct Cost Category	1988 \$ x 1,000	EST'G Method	<u>Remarks</u>
Cold Chemical in Bldg Cold Chemical out of Bldg	4,123	Equipment Factored Estimates	The equipment included in these categories were not shown entirely in the equipment list or drawings furnished to Fluor by WHC. Based on the Fluor "Stand-Alone" 212,000 FT facility estimate equipment list, Fluor coordinated with WHC as to which pieces of equipment to include in the WHC "Stand-Alone" 175,000 FT facility estimate. The marked up equipment list is included as Appendix 2. Equipment was factored to installed direct costs applying to the same factors used in Fluor's "Stand-Alone" 212,000 FT facility estimate.
Construction Start-Up	1,980	Allowance	Construction start-up is based on a percentage (1.02%) of direct costs. This is the percentage allowance used in Fluor's "Stand-Alone" 212,000 FT facility estimate, and is derived from the HWVP estimate.
Escalate 1988 Direct Cost \$ to 1989	8,530	Direction	The Fluor "Stand-Alone" 212,000 FT ² facility estimate of direct costs was estimated by Fluor (at WHCs direction) in GFY 1988 dollars. WHC requested the direct costs of the 175,000 FT ² facility in GFY 1989 dollars. An escalation factor of 4.35% was used to escalate GFY 1988 dollars to GFY 1989 dollars. The percentage was submitted to Fluor by KEH.



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4.0 TEC Estimate

A summary of the Total Estimated Cost (TEC) for the "original" WHC Stand-Alone Pre-Treatment facility is provided in Table 4-1. A summary of the Direct Costs, along with a brief estimate basis, is included as Table 4-2. The TEC estimate is subject to the basis and assumptions described in Section 3.0.

TABLE 4-1. TOTAL ESTIMATED COST(TEC) SUMMARY - X \$1,000 FOR WHC "ORIGINAL" PRE-TREATMENT CONCEPT

COST CATEGORIES	WHC "ORIGINAL" STAND-ALONE
Detailed Design	\$45,424
Field Engr & Inspection	! \$17,801
Construction	\$204,613
Engineering Management	\$17,187
Construction Management	\$12,072
Project Management	1 \$15,346 1
Total Cost (Fy 89 Basis)	\$312,443
Escalation	\$192,233
Contingency	\$163,290
Total Estimated Cost	\$667,966

TABLE 4-2. STAND-ALONE FACILITY CONSTRUCTION COST ESTIMATE SUMMARY & BASIS FOR WHO "ORIGINAL" PRE-TREATMENT CONCEPT

	DIRECT COST	,
COST CATEGORIES	X 1,000 (1988 \$)	ESTIMATE BASIS
Temporary Construction	\$2,500	Same allowance as Fluor Stand-Alone estimate
Site Prep	\$935	Fluor Stand-Alone estimate, factored to 175,000 sq ft footprint
Structures	\$50,329	ROM MTO based on WHC drawings Applied HWVP unit installation rates
Fire Protection/Detection	\$2,000	
HVAC	\$10,000	ROM estimate factored from Fluor Stand-Alone estimate based on the ratio of the volume of the two facilities
In-Cell Pipe	\$12,27 8	Jumpers - Based on WHC count of 600 jumpers Embedded pipe and hot pipe trench were a ratio from the Fluor Stand-Alone facility based on the number of in-cell tanks
Electrical Supply	\$1,593	Same allowance as Fluor Stand-Alone estimate
Electrical Distribution	\$5,720	Same allowance as Fluor Stand-Alone estimate
Process Utilities	\$18,159	
DCS System	\$12,896	Same allowance as Fluor Stand-Alone estimate Installation factored from HWVP
HP System	\$10,560	
Communications	\$250	
Remote Handling, Sampling, Analytical & Maint Repair	\$18,296	The remote equipment used in this estimate was coordinated with WHC. See priced equipment list.
Process Equipment:		
In-Cell Equipment Cold Chemical - In Bldg Cold Chemical - Out of Bldg	\$37,779 \$4,123 \$6,685	Same allowance as Fluor Stand-Alone estimate
Construction Startup	\$1,980	Factored from HWVP direct construction costs
Operations Control Building	\$0	1
S/T DIRECT COST-1988 \$	\$196,083	
ESC TO 1989 \$ @ 0.0435	\$8,530	
TOTAL DIRECT COST-1989 \$	\$204,613	

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RPPENDIX 1

FRCILITY DRAWINGS

ATTACHMENT 3

CORPORATE HEADQUARTERS TELEPHONE. (714) 975-2000 TELEX 56-1441 MESSAGE CENTER FACSIMILE

~ CMNIFAX G99 (714) 975-5981 GP 1, 2, 3

RAPICOM, (714) 975-5963
FACSIMILE CONFIRMATION, (714) 975-6988

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FACSIMILE LEAD SHEET

3/1/89

ENGINEERS, INC. SOUTHERN CALIFORNIA DIVISION TELEPHONE: (714) 975-2000

TELEX: (TT 4720147

MESSAGE CENTER FACSIMILE RAPICOM: (714) 975-5271

OMNIFAX G96 (714) 975-6549 GP 1, 2, 3 OMNIFAX G98 (714) 975-3778 GP 1, 2, 3 FACSIMILE CONFIRMATION: (714) 975-8272

SPECIAL INFORMATION OR INSTRUCTIONS TO RECIPIENT

•	FOR MESSAGE CENTER	Operator's
	Time and Date Transmitted: Receipt Confirmed;	initials:
	Confirmed By:	

PRINTED IN U.S.A.

FORM G-314 REV. 3/85

TABLE 4-1. TOTAL ESTIMATED COST(TEC) SUMMARY - x \$1,000 FOR WHC "ORIGINAL" PRE-TREATMENT CONCEPT

COST CATEGORIES	WHC "ORIGINAL"
Detailed Design	\$42,751
Field Engr & Inspection	\$16,754
Construction	\$192,571
Engineering Management	\$16,176
Construction Management	\$11,362
Project Management	\$14,443
	'
Total Gost (Fy 89 Basis)	\$294,057
Escalation	\$187,195
Contingency	\$155,991
Total Estimated Cost	\$637,243

TABLE 4-2. CO-LOCATED FACILITY CONSTRUCTION COST ESTIMATE SUMMARY & BASIS FOR WHC "ORIGINAL" PRE-TREATMENT CONCEPT

COST CATEGORIES	DIRECT COST X 1,000 (1988 \$)	ESTIMATE BASIS
Temporary Construction	\$1,000	Same allowance as Fluor Co-Located estimate
Site Prep	l \$79 1	Fluor Co-Located estimate, factored to 175,000 sq ft footprint
Structures	\$50,891	ROM MTO based on WHC drawings Applied HWVP unit installation rates
Fire Protection/Detection	 \$2,000	
HVAC	\$8,000 	ROM estimate factored from Fluor Co-Located estimate based on the ratio of the volume of the two facilities
in-Cell Pipe	! \$12,278 	Jumpers - Based on WHC count of 600 jumpers Embedded pipe and hot pipe trench were a ratio from the Fluor Stand-Alone facility based on the number of in-cell tanks
Electrical Supply	\$184	Same allowance as Fluor Co-Located estimate
Electrical Distribution	\$5,720	i Same allowance as Fluor Co-Located estimate
Process Utilities	f \$13,351	
DCS System	\$12,896	i Same allowance as Fluor Co-Located estimate Installation factored from HWVP
HP System	\$9,148	
Communications	\$250	
Remote Handling, Sampling, Analytical & Maint Repair	\$18,296	The remote equipment used in this estimate was coordinated with WHC. See priced equipment list.
Process Equipment:		
In-Cell Equipment Cold Chemical - In Bldg Cold Chemical - Out of Bldg	\$4,123	Equipment based on WHC supplied equipment list Same allowance as Fluor Co-Located estimate Same allowance as Fluor Co-Located estimate
Construction Startup	\$1,863	 Factored from HWVP direct construction costs
Operations Control Building	\$0]
S/T DIRECT COST-1988 \$	\$184,543	1
ESC TO 1989 \$ @ 0.0435	\$8,028	
TOTAL DIRECT COST-1989 \$	\$192,571	; ;

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ATTACHMENT 4

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CORPORATE HEADQUARTERS TELEPHONE: (714) 975-2000 TELEX. 66 1441 MESSAGE CENTER FACSIMILE

RAPICOM. (714) 975-5983 FACSIMILE CONFIRMATION, (714) 975-6988

¥ FLUOR DMNIFAX G99 (714; 975-5981 GP 1, 2, 3 FACSIMILE LEAD SHEET

ENGINEERS, INC. SOUTHERN CALIFORNIA DIVISION TELEPHONE: (714) 975-2000 TELEX: 177 4720147 W.U. 181525

MESSAGE CENTER FACSIMILE RAPICOM: (714) 975-5271

OMNIFAX G96 (714) 975-6549 GP 1, 2, 3 OMNIFAX G99 (714) 975-3778 GP 1, 2, 3 FACSIMILE CONFIRMATION: (714) 975-5272

Number of documents 23

including lead sheet. PLEASE COMPLETE THE FOLLOWING To: Company Name: Westinghouse Hanford Company Attn: F. P. Anantatmula City: __Richland ___ State: WA ____ Country: _____ Originator's Name: Jack Donnally Extension: 4434 Facsimile Number to be called: Area Code: 166 Number: 440-2908 Facsimile Confirmation Number: Area Code: ______ Number: _____ Charge to Org. Number: _____ Contract Number: _____ Emp. Number: _____ Return Originals Through Interoffice Mail to: _______ Location:______ Call for Pickup of Originals After Transmission, Name: ______ Extension:_____ SPECIAL INFORMATION OR INSTRUCTIONS TO RECIPIENT

FOR MESSAGE CENTER ———— Operator's initials: Time and Date Transmitted: _______ Receipt Confirmed: ______

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Cost Study

Process and Facility Options for Pre-Treatment of Hanford Tank Wastes

WHC 132,000 sq ft Stand-Alone Concept

March 9, 1989

Fluor Daniel Inc.
Advanced Technology Division
Irvine, California



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References

- Cost Studies Process and Facility Options for Pre-Treatment of Hanford Tank Wastes, dated February, 1989, - by Fluor Daniel Inc.
- Cost Study Process and Facility Options for Pre-Treatment of Hanford Tank Wastes, Stand-Alone Concept (WHC Concept), dated March 1989, - by Fluor Daniel, Inc.



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1.0 Introduction

Fluor Daniel was requested to prepare cost studies for three pre-treatment alternatives by Westinghouse Hanford Company (WHC). The cost studies were provided via a report titled, cost studies - Process and Facility Options for Pre-Treatment of Hanford Tank Wastes, dated, February, 1989. A "stand-alone" concept was included in the above study based on a concept developed by WHC. Fluor Daniel was requested to review the original concept and incorporate the necessary modifications in conjunction with WHC. The modifications included such items as additional contact and remote maintenance and laydown areas, addition of a chiller room for the HVAC, expanded HVAC equipment rooms, addition of an off-gas system, and expansion of the cold chemical storage area. The extent of these modifications are discussed in reference 1.

During the course of the development of the cost studies, WHC requested that Fluor Daniel develop a ROM cost for the "stand-alone" pre-treatment facility as originally submitted by WHC. This cost study would be utilized to compare other alternatives on a common basis. Fluor Daniel responded to the request by providing a ROM cost study submitted as reference 2.

In early March, WHC requested Fluor Daniel to develop an additional ROM cost estimate for a 132,000 sq ft facility. The estimate was prepared over a two day time period, using previously developed data, and the results are included herein.



2.0 Description

A cost study for the 132,000 sq ft WHC stand-alone pre-treatment facility was based on the drawings included as Appendix 1. The ROM estimate utilized data developed for the stand-alone pre-treatment facility submitted in references 1 and 2. The estimate basis and qualifications are described in Section 3.0 of this report.



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3.0 Basis and Assumptions

3.1 General Basis

The direct costs for the stand-alone pre-treatment facility were estimated using the following methods:

- o Allowances from the HWVP Reference Conceptual Design (RCD) Rev. 1 estimate.
- o MTO using unit rates of installation derived from the RCD Rev. 1 estimate, expressed in 1988 dollars.
- o Equipment factored estimates using equipment cost to direct installed costs based on ratios (factors) derived from the RCD Rev. 1 estimate.

Engineering/Design and engineering and inspection during construction, construction and project management costs were estimated as percentages of direct costs based on indirect to direct cost relationships in the RCD Rev. 1 estimate.

All costs were estimated in GFY 1988 dollars and escalated by 4.35% to GFY 1989 (as requested by WHC) to achieve compatibility with the KEH estimate of the facility. The basis for escalation is Kaiser's table KEHRII dated 2/22/89, using February 1989 as the base date.

The schedule utilized for escalation was the same schedule used for the stand-alone pre-treatment facility included in the referenced cost study.

The contingency evaluation was based on the contingency analysis used for the stand-alone pre-treatment facility included in the referenced cost study. It is the opinion of



Fluor Daniel, that the contingency calculated in this manner may not be consistent with the estimating techniques used to develop the estimate. A detailed contingency analysis should be performed for this estimate if this pre-treatment alternative becomes viable.

The WHC drawings for the 132,000 sq ft facility are included as Attachment 1.

All costs are Total Estimated Costs (TEC). Expense funded costs such as Research and Development and Conceptual Design are not included. Life cycle costs have not been estimated.

3.2 Specific Basis

Direct Cost Category	1988 \$ x 1,000	EST'G <u>Method</u>	Remarks
Temp Const	2,500	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT" pre-treatment facility estimate. (\$2,500M is approximately 80% of RCD Rev. 1 estimate of temp const.)
Site Prep	938	Allowance	Allowance from Fluor's "Stand-Alone" 212,000 FT facility estimate. Includes security fence/lighting/roads & site clearance based on 132,000 FT facility footprint. (Unit rates from RCD Rev. 1 estimate)
Structures	40,632	MTO	ROM, MTO based on WHC furnished 132,000 FT facility dwgs. This category includes sitework, concrete, structural steel, cell lining, & architectural costs.
Fire Prot. & Det.	2,000	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT estimate. (allowance of double RCD Rev. 1 Vit Bldg cost for this category)
HVAC	7,500 ROM	Allowance	Factored from Fluor's "Stand-Alone" 212,000 FT" estimate:
			HVAC Cost for the VOL 132,000 FT ² FAC VOL 212,000 FT FAC
In-Cell Pipe items:	12,231	Various	This cost category includes the following
			o embedded pipe o hot pipe trench o in-cell jumpers

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Direct Cost Category	1988 \$ x 1,000	EST'G Method	Remarks
			The unit costs for the above items are from Fluor's "Stand-Alone" 212,000 FT facility adjusted to the 132,000 FT facility by the following methods:
			o embedded pipe
			212,000 FT ² Cost 30 in-cell tanks x 39 in-cell tanks
•			o hot pipe trench:
			212,000 FT ² Cost Hot Trench Length 132,000FT ² EST x Hot Trench Length 212,000FT ² EST
			o in-cell jumpers:
			600 jumpers (furnished by WHC) x direct cost per jumper derived from the RCD Rev. 1 estimate.
Electrical Supply	1,593	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est.
Electrical Distribution	5,720	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est.
Process Utilities	18,159	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT" est. (Capacity factored HWVP RCD Rev. 1 utility system estimate.)
DCS	12,896	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est. (Equipment factored estimate based on HWVP DCS equipment cost to installed direct cost ratios.)

Direct Cost Category	1988 \$ x 1,000	EST'G <u>Method</u>	Remarks
HP System	10,560	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT est. (Equipment factored estimate based on HWVP HP equipment cost to installed direct cost ratios.)
Communications	250	Allowance	Same allowance as Fluor's "Stand-Alone" 212,000 FT facility estimate. (Allowance from HWVP Vit Bldg Estimate.)
Remote Handling, Sampling Analytical Maint Repair. This cost category includes:	18,084 Fac	Equipment tored Estimate	The equipment included in this category was not included with in the WHC data received & by Fluor. Based on the Fluor "Stand-Alone" 212,000 FT facility estimate equipment list, Fluor coordinated with WHC as to which pieces or quantities of equipment to include in the
o Regulated, Non- Regulated & MSM Repair			WHC 132,000 FT "Stand-Alone" facility estimate. The marked up equipment list is included as Appendix 2. Equipment was factored to installed direct costs by
o Equipment decon Repair and Maintenance	•		applying the same factors used in Fluor's "Stand-Alone" 212,000 FT facility estimate.
o Process Sampling	3		
o Analytical			
o Remote Handling Equipment			
In-Cell Equipment	37,779	Equipment Factored Estimate	The Fluor "Stand-Alone" 212,000 FT ² facility equipment list (see Appendix 2) was adjusted to conform to the equipment list furnished to Fluor by WHC see Appendix 2. The resultant total equipment cost was factored to installed direct costs by applying the same factor used in Fluor's "Stand-Alone" 212,000 FT ² facility estimate.

Direct Cost Category	1988 \$ x 1,000	EST'G <u>Method</u>	Remarks
Cold Chemical in Bldg Cold Chemical out of Bldg	4,123 6,685	Equipment Factored Estimates	The equipment included in these categories were not shown entirely in the equipment list or drawings furnished to Fluor by WHC. Based on the Fluor "Stand-Alone" 212,000 FT ² facility estimate equipment list, Fluor coordinated with WHC as to which pieces of equipment to include in the WHC "Stand-Alone" 132,000 FT ² facility estimate. The marked up equipment list is included as Appendix 2. Equipment was factored to installed direct costs applying to the same factors used in Fluor's "Stand-Alone" 212,000 FT ² facility estimate.
Construction	1,735	Allowance	Construction start-up is based on a Start-Up percentage (1.02%) of direct costs. This is the percentage allowance used in Fluor's "Stand-Alone" 212,000 FT facility estimate, and is derived from the HWVP estimate.
Escalate 1988 Direct Cost \$ 1989	7,530	Direction	The Fluor "Stand-Alone" 212,000 FT ² facility estimate of direct costs was estimated by to Fluor (at WHCs direction) in GFY 1988 dollars. WHC requested the direct costs of the 132,000 FT ² facility in GFY 1989 dollars. An escalation factor of 4.35% was used to escalate GFY 1988 dollars to GFY 1989 dollars. The percentage was submitted to Fluor by KEH.

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4.0 TEC Estimate

A summary of the Total Estimated Cost (TEC) for the WHC 132,000 sq ft Stand-Alone Pre-Treatment facility is provided in Table 4-1. A summary of the Direct Costs, along with a brief estimate basis, is included as Table 4-2. The TEC estimate is subject to the basis and assumptions described in Section 3.0.

TABLE 4-1. TOTAL ESTIMATED COST(TEC) SUMMARY - X \$1,000 FOR WHC 132,000 SQ FT PRE-TREATMENT CONCEPT

COST CATEGORIES	WHC "ORIGINAL"
Detailed Design	\$40,112
Field Engr & Inspection	\$15,720
Construction	\$180,690
Engineering Management	\$15,178
Construction Management	\$10,660
Project Management	\$13,550
Total Cost (Fy 89 Basis)	\$275,910
Escalation	\$169,760
Contingency	\$145,140
Total Estimated Cost	\$590,810

TABLE 4-2. STAND-ALONE FACILITY CONSTRUCTION COST ESTIMATE SUMMARY & BASIS FOR WHIC 132,000 SQ FT PRE-TREATMENT CONCEPT.

		•
	DIRECT COST	
COST CATEGORIES	X 1,000 (1988 \$)	ESTIMATE BASIS
Temporary Construction	\$2,500	Same allowance as Fluor Stand-Alone estimate
Site Prep	\$938	Fluor Stand-Alone estimate, factored to 132,000 sq ft
Structures	\$40,632	footprint ROM MTO based on WHC drawings Applied HWVP unit installation rates
Fire Protection/Detection	\$2,000	 Same allowance as Fluor Stand-Alone estimate
HVAC	\$7,500 !	ROM estimate factored from Fluor Stand-Alone estimate based on the ratio of the volume of the two facilities
In-Cell Pipe	•	Jumpers - Based on WHC count of 600 jumpers Embedded pipe and hot pipe trench were a ratio from the Fluor Stand-Alone facility based on the number of in-cell tanks
Electrical Supply	\$1,593	Same allowance as Fluor Stand-Alone estimate
Electrical Distribution	\$5,720	Same allowance as Fluor Stand-Alone estimate
Process Utilities	\$13.700	ROM estimate factored from Fluor Stand-Alone estimate
DCS System	 \$12,896 	based on the ratio of square footage. Same allowance as Fluor Stand-Alone estimate Installation factored from HWVP
HP System	l [\$10,560	
Communications) \$250	Same allowance as Fluor Stand-Alone estimate
Remote Handling, Sampling, Analytical & Maint Repair	 \$18,084 	The remote equipment used in this estimate was coordinated with WHC. See priced equipment list.
Process Equipment:	} 	! !
In-Cell Equipment Cold Chemical - In Bldg Cold Chemical - Out of Bldg	\$32,013 \$4,123 \$6,685	
Construction Startup	\$1,735	Factored from HWVP direct construction costs
Operations Control Building	 \$0	1
S/T DIRECT COST-1988 \$	\$173,160	
E5C TO 1989 \$ @ 0.0435	\$7,530	1
TOTAL DIRECT COST-1989 \$	\$180,690	[

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RPPENDIX 1

FACILITY DRAWINGS

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APPENDIX Z

EQUIPMENT LIST

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ATTRIC ACID DILUTION TARE	OUT OF DEDE/	4			İ
SODIUR HYDROXIDE DILUTION TAI	DILUTION TARK NOT IN BLOG/	\ \	200 EA	HISH 4 - 9 - 5 - Ca-	STATE
	DILUTION TARE ROT IN BLOG	~ \ -			
SOUTH HYPROTIDE DILUTION TAKE AGITATOR A	ONI-DE-CELL	!. !			[
SORIUM MITRIE HII THAL	MOT IN BEDSS	4	300 BAL	H18H 4 6 1 5 0 1	STATALL
SODIUM MITRITE AIT TARF TRANSFER PUMP A	OUT-OF-CELL				
SODIUM NITRITE MIX TANL	NOT IN BLOG/	4			
PRECOAT AIX TANK	NOT IN BLOG/		200 EAL 1	HSIH 10.5 1 0.0	STATE
FRECORT ALL TANK	NOT IN BLOG?	4			
PRECOAT MIX TANK AGITATOR A	ROT IN BLOS/	4			
TOTAL COLD CHEKICAL OUT OF PLDS	5				
RES KATRTENANCE EQUIPMENT	KEB KAIRI SHOP	9			
NON-REG MAINTENANCE EQUIPMENT	מאט סכר אואא		•		
KSK REPAIR EQUIFHERT	יונמ"רנט אונון	9			1

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FEPATA FEPATA	STATHLESS	STREL		1,770 2,770 1,770 1,770 1,770 1,770		1	STAINLESS : 1,808	103	11,911	75' 1 11 1 20 CARBON 151EL	CEND BLASS	LEND BLASS	STATES			CAREOR 166	DW CAPBON 1,218	STRUM 255 653	STAINLESS 263	1,122	STAINLESS 31
SAMPLE CONT. SA	ANALITTAL CELES	CI	RA 1 WENDANE	SARPLE/ANALYT PONS	SAPLE LELLS TS TS N.		HOT LAB	COLD LAB	,	CANYDAY GOIT OF LELL 1 50 TON		SARPLE REMUTE CELLS TO	VARIOUS REMOTE CELLS 72. TORE 7	REAUTE MAIN CELLS Y PAR 3000	ASK REPAIR 5 STREET	FRINT AREA	東下5.7			CUT-UP KDOX	

96616. 47 116

From:

Engineering Services W23170

Phone:

3-2955 R1-17

Date:

March 30, 1989

Subject:

DOCUMENTATION OF KEH DESIGN ON NEW FACILITY OPTIONS

RECEIVED

APR U 1989

To:

D. E. McKenney

McKenney

cc: D. E. Ball JSG File/LB R1-17 w/o attachments

DEFINE DET

This letter provides back up drawings and FASTC estimates prepared by Kaiser Engineering for two new pretreatment facility options. The estimate comparisons are summarized on Page 2.

Attachment 1 the smaller throughput facility

Attachment 2 the larger throughput facility

Attachment 3 the derivation of PFM comparisons

J. S. Garfield

Principal Engineer

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	LARGER T	HROUGHPUT	PRETREATM	ENT BLIG	SMALLER	THROUGHPU	IT PRETREATI	ENT BLDG		PFM	VIT	BLDG
STRUCTURAL HVAC ELEC/MECH UTILITIES MISC (EXCAVATION)	FACTOR (PFM) 19.623 14.67 28.967 4.367 105.964	65700 15200 78700 2900	FACTOR 2(VIT BLDG 13.643 2.951 47.874 4.367 105.694	KBH 175000FT2 47100 10000 124800 2900 3100	FACTOR (PFM) 19.623 4.67 28.957 4.367 105.694	51300 11900 61300 2900	FACTOR 22(VIT BLDG) 13.643) 2.951) 47.874) 4.367) 105.694	XXH *132000 36800 7800 97100 2900 2400	19 7. 33	ACTOR 9.623 .473 3.389 9.426	PFM FACTOR COSTS 46200 13.643 16400 2.951 62100 47.874 9900 5100	VIT BLDG COSTS 58700 11700 140900
DIRECT CONST (89\$ - TOTAL SQUARE FT COST/FT2		165600 175000 946		187900 175000 1074	FI2 \$/FI2	129800 132000 983		147000 132000 1114		[2 /FT2	139700 116000 FT2 1204 \$/FT2	211300 185000 FT2 1142 \$/FT
DETAILED DESIGN (22%) ENG MANAGEMENT (8.4%) TITLE III INSPECTION (8.0% CONST MANAGEMENT (9%) PROJ MANAGEMENT(10%)	22 8) 8 9 10	13910 13248 14904	8 8 9	41714 15784 15032 16911 18790	22 8 8 9 10	10903 10384 11682	8 8 1 8 2 9	32634 12348 11760 13230 14700		48 0 0 8 8	67335 0 0 11316 10589	·
FY 89 TOTAL		260986		296130		204565	5	231672			228940	.
ESCALATION (60%) CONTINGENCY (35%)		156591 146152		177678 165833		122739 114556		139003 129736		PFM PFM		
TOTAL PROJECT COS	T	564000		640000		442000)	500000			255000	
BUILDING VOLUME CONCRETE VOLUME LINEAL FT OF CELL	ı	3.5M FT3 51000 YD 636 FT				2.8m ft3 40000 yi 445 ft					2.9M FT3 33800 YDS 325 FT	

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Attachment I
Pretreatment 132,000 ft²

PRETREATMENT II

	AREA					VOLUME	
(-) 30'-0" Level							
. Stairwell	32	X	16	512 x	60	30,720	
. Stairwell	10	X	21	210 x	60	12,600	
. Stairwell	10	Х	21	210 x	60 60	12,600	
. Stairwell	10	X	21	210 x	60 60	12,600	
. Stairwell	10 42	X	21	210 x 966 x	60 15	12,600	
. Remote HEPA Crane Maint Area	25	X	23 23	575 x	15	14,490 8,625	
Suit Up AreaRemote HEPA Filter Test/Monitor	44	x	15	660 x	15	9,900	
. Filter Change Out Cont Room	18	x	11	198 x	15	2,970	
. Air Lock/Corridor	70	X	îî	770 x	15	11,550	
. FECA Operating Area	34	X	25	850 x	15	12,750	
. FECA Cell	39	X	25	975 x	15	14,625	
. Remote HEPA Filter Area	47	X	42	1,974 x	15	29,610	
· · · · · · · · · · · · · · · · · · ·	11	X	15	165 x	15	2,475	
. Hot Shop/Air Lock/Corridor	221	X	25	5,525 x	15	82,875	
. Storage Maintenance	221	X	25	5,525 x	15	82,875	
. Corridor/Air Lock	72	X	25	1,800 x	15	27,000	
. Narrow Corridor	100	X	10	1,000 x	15	15,000	
. Elevator	25	X	20	500 x	45	22,500	
. Cell A	133	X	20	2,660 x	40	106,400	
. Cell B	133	X	20	2,660 x	40	106,400	
. Cell C	25	X	20	500 x	40	20,000	
•	25	X	20	500 x	40	20,000	
•	62	Х	20	1,240 x	40	49,600	
. Air Tunnel	161	X	12	1,932 x	.6	11,592	
. Closed Loop Area	161	X	12	1,932 x 34,259 FT ²	12	23,184 755,541	FT3
Subtotal				34,259 F1-		755,541	Li
(-) 13'-0" Level							
. Primary/Secondary Steam Gen	47	х	67	3,149 x	15	47,235	
· · · · · · · · · · · · · · · · · · ·	34	X	23	782 x	15	11,730	
. Rail/Truck Access	74	X	25	1,850 x	31	57,350	
. Sample Gallery	221	X	25	5,525 x	15	82,875	
. Sample Gallery	221	X	25	5,525 x	15	82,875	
. Sample Gallery	72	X	25	1,800 x	15	27,000	
. Laboratory	62	X	60	3,720 x	15	55,800	
. Elevator	25	Х	20	500 x	45	22,500	
. Elevator	32	X	16	512 x	45	23,040	
. FECA Operating Area	34	X	25	850 x	15	12,750	
. FECA Cell	26	X	37	962 x	15	14,430	
. Hot Pipe Trench	12		159	1,908 x	12	22,896	
. Remote HEPA Filter Room	40	X	32	1,280 x	15	19,200	FT ³
Subtotal Subtotal				28,363 FT ²		479,681	Li

(+) 4'-0" Level

 FECA Cell HVAC Room FECA Operating Area Instm/Service Gallery Instm/Service Gallery Instm/Service Gallery Control Room Office Complex HVAC Filter Room HVAC Fan Room Elect/Switchgear Room Emergency Generator Subtotal 	26 67 34 221 72 128 128 90 85 62 48	x	47 25 25 25 25 21 50 60 60	850 5,525 5,525 1,800 2,688 6,400	x x x x x x x x x x	15 15 15 15 15 15 15 15 15 15	14,430 47,235 12,750 82,875 82,875 27,000 40,320 96,000 81,000 76,500 19,530 25,200 605,715	FT3
(+) 21'-0" Level . Chem/Make Up Storage . Chem/Make Up Strorage . Crane Maintenance . Canyon Deck Subtotal TOTALS (-) 30'-0" Level (-) 13'-0" Level (+) 4'-0" Level	221 221 64 269 34,259 28,363 40,381	x x x	25 25 20 62		X X X	15 15 35 43	82,875 82,875 44,800 717,154 927,704	FT ³
(+) 21'-0" Level TOTAL	29,008 132,011	FT2	2,	927,704 768,641	(2.8m	FT ³)		

RDC:tst

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PRETREATMENT II (Concrete Volume)

(-)	30'-0)"]	Level
-----	-------	------	-------

(-) 13'-0" Level

(4) 4'-0" Level

(+) 21'-0" Level

Floor	=	6,077.4
Walls	=	6,569.4

Total

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(-) 30'-0" Level	=	12,064.2
(-) 13'-0" Level (+) 4'-0" Level (+) 21'-0" Level	=	7,145.2
(+) 4'-0" Level	=	8,084.1
(+) 21'-0" Level	=	<u>12,646.8</u>

39,940.3 YD³

RDC:tst

132,000 flz returnment w/ PFIN FACTORS

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY

PAGE 1 OF 6
DATE 03/03/89 01:19
BY F.C. DAY

KEHRO1 - PROJECT COST SUMMARY

COST		ESCALATED	CONTIN	GENCY	TOTAL
CODE	DESCRIPTION	TOTAL COST	%	TOTAL	DOLLARS
=====		=========	=====	=========	=======================================
000	ENGINEERING	74,900,000	35	26,220,000	101,120,000
460	IMPROVEMENTS TO LAND	4,250,000	35	1,490,000	5,740,000
501	BUILDINGS	246,490,000	35	86,270,000	332,760,000
	(ADJUSTED TO MEET DOE 5100.4)	-40,000		20,000	-20,000
		********	=======	=======================================	*********
Pi	ROJECT TOTAL	325,600,000	35	114,000,000	439,600,000

TYPE OF ESTIMATE	ROM	MARCH 3, 1989	REMARKS:
ARCHITECT DE ENGINEER			
OPERATING CONTRACTOR			

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO2 - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 6 DATE 03/03/89 01:19 BY F.C. DAY

WBS DESCRIPTION	ESTIMATE SUB Total	OTHER INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB Total	CONTINGENCY % TOTAL	TOTAL DOLLARS
110001 DEFINITIVE DESIGN	28800000	0	28800000	38.75 11160000	39960000	35 13986000	53946000
120001 ENGINEERING/INSPECTION	10400000	Ö	10400000	68.25 7098000		35 6124300	23622300
130001 ENGINEERING MANAGEMENT	10900000	Ŏ	10900000	60.05 6545450		35 6105908	23551358
SUBTOTAL 1 ENGINEERING	50100000	0	50100000	49.51 2480345	74903450	35 26216208	101119658
320001 FP CONSTRUCTION	129800000	11697000	141497000	62.50 8843562		35 80476419	310409044
330001 WHC PROJECT MANAGEMENT	13000000	0	13000000	60.05 780650	20806500	35 7282275	28088775
SUBTOTAL 3 CONSTRUCTION	142800000	11697000	154497000	62.29 9624212	250739125	35 87758694	338497819
DRO LEGT. TOTAL	=======================================	======================================	==#======	======================================	:==###===##F	:========= 113,974,901	=========
PROJECT TOTAL	192,900,000		04,597,000	59.16	325,642,575	35	439,617,476

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO3 - ESTIMATE BASIS SHEET

PAGE 3 OF 6 DATE 02/15/89 09:56 BY F.C. DAY

1. DOCUMENTS AND DRAWINGS _____ DOCUMENTS

DRAWINGS: ES-800-1 THRU ES-800-9 & ES-800-12

2. MATERIAL PRICES **********

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. ESCALATION

========

ESCALATION CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, JANUARY 1989.

4. ROUNDING - LINE ITEMS:

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (H), REQUIRES ROUNDING OF A COST ESTIMATE TO \$10,000 FOR ITEM COST AND \$100,000 FOR TOTAL COST. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

5. REMARKS

=======

- A. THE COST ESTIMATE WAS DEVELOPED USING THE "FASTC" PARAMETRIC CONSTRUCTION MODEL. THOSE COSTS WERE THEN PUT INTO THE LEST FORMAT FOR ADDITION OF ESCALATION, CONTINGENCY, AND SIN OFF.
- B. THE ESTIMATE ADDRESSES ONLY THE COST OF CONSTRUCTION OF A NEW BUILDING AND ASSOCIATED ITEMS, IT DOES NOT INCLUDE ANY WORK TO BE PERFORMED BY THE ONSITE CONSTRUCTION FORCES REGARDING TIE-INS OR ROUTING OF EXISTING LINES.

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO4 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 6 DATE 03/03/89 01:19 BY F.C. DAY

COST CODE WBS DESCRIPTION	ESTIMATE SUB Total	OTHER INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB Total	CONTINGENCY % TOTAL	TOTAL Dollars
000 ENGINEERING							
110001 DEFINITIVE DESIGN 120001 ENGINEERING/INSPECTION 130001 ENGINEERING MANAGEMENT	28800000 10400000 10900000	0 0 0	28800000 10400000 10900000	38.75 11160000 68.25 7098000 60.05 6545450	17498000	35 13986000 35 6124300 35 6105908	53946000 23622300 23551358
TOTAL DOO ENGINEERING	50100000	0	50100000	49.51 24803450	74903450	35 26216208	101119658
460 IMPROVEMENTS TO LAND	·						
320001 FP CONSTRUCTION	2400000	216000	2616000	62.50 1635000	4251000	35 1487850	5738850
TOTAL 460 IMPROVEMENTS TO LAND	2400000	216000	2616000	62.50 1635000	4251000	35 1487850	5738850
501 BUILDINGS							
320001 FP CONSTRUCTION 330001 WHC PROJECT MANAGEMENT	127400000 13000000	11481000 0	138881000 1300000	62.50 86800625 60.05 7806500		35 78988569 35 7282275	304670194 28088775
TOTAL 501 BUILDINGS	140400000	11481000	151881000	62.29 9460712	246488125	35 86270844	332758969
	==========	=======================================		* = = = = = = = = = = = = = = = = = = =	:======================================		**======
PROJECT TOTAL	192,900,000	11,697,000	204,597,000	121,045,575 59.16	******	******** 35	439,617,476
	172,700,000		טטט, זיכנ, אט.	37.10		ر د	737,011,410

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHROS - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 5 OF 6 DATE 03/03/89 01:19 BY F.C. DAY

CSI DIV DESCRIPTION ************************************	ESTIMATE SUB TOTAL	OTHER INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
ENGINEERING							
ENGINEERING	50100000	0	50100000	49.51 24803450	74903450	35 26216208	101119658
TOTAL ENGINEERING	50100000	0	50100000	49.51 24803450	74903450	35 26216208	101119658
CONSTRUCTION							
O2 SITEWORK	2400000	216000	2616000	62.50 1635000	4251000	35 1487850	5738850
03 CONCRETE	51300000	4617000	55917000	62.50 34948125	90865125	35 31802794	122667919
15 MECHANICAL	76100000	686400 0	82964000	62.50 51852500	134816500	35 47185775	182002275
20 BURNOUT	13000000	Ð	13000000	60.05 7806500	20806500	35 7282275	28088775
TOTAL CONSTRUCTION	142800000	11697000	154497000	62.29 96242125	250739125	35 87758694	338497819
	========	========			========		*=======
PROJECT TOTAL	192,900,000	11,697,000	04,597,000	121,045,575 59.16	******	35	439,617,476

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY

PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO7 - ONSITE INDIRECT COSTS BY WBS

PAGE 6 OF 6 DATE 03/03/89 01:20 BY F.C. DAY

WBS	DESCRIPTION	ESTIMATE SUB Total	CONTRACT % =====	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
110001	DEFINITIVE DESIGN	28800000	0.00	0	0	0	0
	ENGINEERING/INSPECTION	10400000	0.00	0	0	0	0
		10900000	0.00	0	0	0	0
	FP CONSTRUCTION	129800000	9.00	11682000	15000	0	11697000
•	WHC PROJECT MANAGEMENT	13000000	0.00	0	0	0	0
			######################################	=======================================	*****	=======================================	
PROJEC	T TOTAL	192,900,000			15,000		11,697,000
	•	•		11,682,000		0	

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

ACCOUNT

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE

PAGE 0001 DATE 03/03/89 01:20 BY F.C. DAY

KEHROB - ESTIMATE DETAIL BY WBS / COST CODE

COST EQUIP SUB- EQUIP- OH&P TOTAL

NUMBER ========	DESCRIPTION	CODE	QUANTITY =======	MANHOURS	LABOR =======	USAGE	MATERIAL	CONTRACT	MENT =======	/ 8 & 1	DOLLARS
110001	DEFINITIVE DESIGN										
110001.00	TECHNICAL SERVICES										
110001.000010	2 DEFINITIVE DESIGN	000	1 LS	0	0	0	0	28800000	0	0	28800000
SUBTOTAL	TECHNICAL SERVICES			0	0	0	2	8,800,000	0	0	28,800,000
TOTAL	COST CODE 00000 WBS 110001			0	0	0	2	8,800,000	0	0	28,800,000
	(ESCALATION 38.75% - CONTINGE	NCY 35	5.00%)								
								• • • • • • • •			
TOTAL WBS 1	10001 DEFINITIVE DESIGN			0	0	0) 2 0	8,800,000	0	0	28,800,000

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0002 DATE 03/03/89 01:20 BY F.C. DAY

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	HANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I =======	TOTAL DOLLARS
120001	ENGINEERING/INSPECTION									•	
120001.00	TECHNICAL SERVICES										
120001.000010	O ENGINEERING/INSPECTION	000	1 LS	0	0	0	0	10400000	0	0	10400000
SUBTOTAL	TECHNICAL SERVICES			0	0	0	1 0	0,400,000	0	0	10,400,000
TOTAL	COST CODE 00000 WBS 120001			0	0	0	1 0	0,400,000	0	0	10,400,000
	(ESCALATION 68.25% - CONTINGE	NCY 35	i.00%)								
TOTAL WBS 1	20001 ENGINEERING/INSPECTION			0	0	0	1 0	0,400,000	0	0	10,400,000

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0003 DATE 03/03/89 01:20 BY F.C. DAY

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P TOTAL / B & 1 DOLLAR	
130001	ENGINEERING MANAGEMENT										
130001.00	TECHNICAL SERVICES										
130001.000010	O ENGINEERING MANAGMENT	000	1 LS	0	0	0	0	10900000	0	0 10900	000
SUBTOTAL	TECHNICAL SERVICES			0	0	0	1 0	0,900,000	0	10,900,	000
TOTAL	COST CODE 00000 WBS 130001			0	0	0	1 0	0,900,000	0	0	000
	(ESCALATION 60.05% - CONTINGE	NCY 3	5.00%)								
TOTAL WBS 1	30001 ENGINEERING MANAGEMENT			0	0	0	1	0,900,000	0	0 10,900,	000

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

(ESCALATION 62.50% - CONTINGENCY 35.00%)

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0004 DATE 03/03/89 01:20 BY F.C. DAY

ACCOUNT NUMBER	DESCRIPTION	COST CODE ====	QUANTITY	MANHOURS	LABOR	EQUIP USAGE =====	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
320001	FP CONSTRUCTION										
320001.02	SITEWORK										
320001.0200100	D EXCAVATION - INCLS. THE COST FOR CLEARING & GRUBBING OF	460	1 LS	0	0	0	0	0	0	0	0
320001.020010	SITE, EXCAVATION AND 2 BACKFILL FOR THE BUILDING	460	1 LS	0	0	0	0	2400000	0	0	2400000
SUBTOTAL	SITEWORK			0	0	0	0	2,400,000	0	0	2,400,000
TOTAL	COST CODE 46002 WBS 320001			0	0	0	0	2,400,000	0	0	2,400,000
	(ESCALATION 62.50% - CONTINGE	NCY 35	5.00%)								
320001.03	CONCRETE										
320001.030010	O STRUCTURE COST - INCLS. THE EXTERNAL STRUCTURE(WALL FACE		1 LS	0	0	0	0	0	0	0	Ģ
320001.030010	S, ROOFING, CONNECTING WALLS WINDOWS), SUPERSTRUCTURE, & INTERNAL STRUCTURE(WALLS, CEILINGS, FLOORS, DOORS, ETC.)	501	1 LS	. 0	0	0	0	51300000	0	0	51300000
SUBTOTAL	CONCRETE			0	0	0	5	1,300,000	0	0	51,300,000
TOTAL	COST CODE 50103 WBS 320001			0	0	0	5	1,300,000	0	0	51,300,000

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHROB - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0005 DATE 03/03/89 01:20 BY F.C. DAY

ACCOUNT Number =======	DESCRIPTION	COST CODE	YTITHAUP	MANHOURS	LABOR	EQUIP USAGE ===#==	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & t ======	TOTAL DOLLARS
320001.15	MECHANICAL										
320001.1500100	HVAC - INCLS. COST FOR THE HEATING, VENTILATING, AIR CONDITIONING, & CONTROLS)	501	1 LS	0	0	0	0	11900000	0	0	11900000
320001.1500200	ELECTROMECHANICAL - INCLS. THE COST FOR ELECTRICAL, PLUMBING, PIPING, FIRE	501	1 ts	0	0	0			0	0	
320001.1500202	PROTECTION, MECHANICAL	501	1 LS	0	0	0	0	61300000	0	0	61300000
320001.1500300	EQUIPMENT, & INSTRUMENTATION UTILITIES - INCLS THE COST FOR RR TRACK SPUR, 10 OUISIDE	501	1 LS	0	0	0	0	0	. 0	0	, 0
320001.1500302	STORAGE TANKS W/CONCRETE PAD AND DIKE, MECHANICAL PIPING & EQUIP., INSTRUMEN- TATION, & PAVING	501	1 LS	; 0	0	0	0	2900000	0	0	2900000
SUBTOTAL	HECHANICAL			0	0	0	7	6,100,000	0	0	76,100,000
TOTAL	COST CODE 50115 WBS 320001			0	0	0	7	6,100,000	0	0	76,100,000
	(ESCALATION 62.50% - CONTINGE	NCY 35	.00%)								
											•
							•				4
TOTAL WBS 3	20001 FP CONSTRUCTION			0	0	0	12	9,800,000	(() 29,800,000

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0006 DATE 03/03/89 01:20 BY F.C. DAY

COST EQUIP SU8-FOUIP-OH&P TOTAL ACCOUNT / B & I DOLLARS DESCRIPTION CODE LABOR USAGE MATERIAL CONTRACT MENT NUMBER

330001 . WHC PROJECT MANAGEMENT

330001.20 BURNOUT

0 13000000 0 0 13000000 330001.2000100 WHC PROJECT MANAGEMENT 501 1 LS 0 0 0 13,000,000 0 SUBTOTAL BURNOUT 13,000,000 0 0 0

TOTAL COST CODE 50120 0 0 13,000,000 0 WBS 330001 0 0 0 13,000,000

(ESCALATION 60.05% - CONTINGENCY 35.00%)

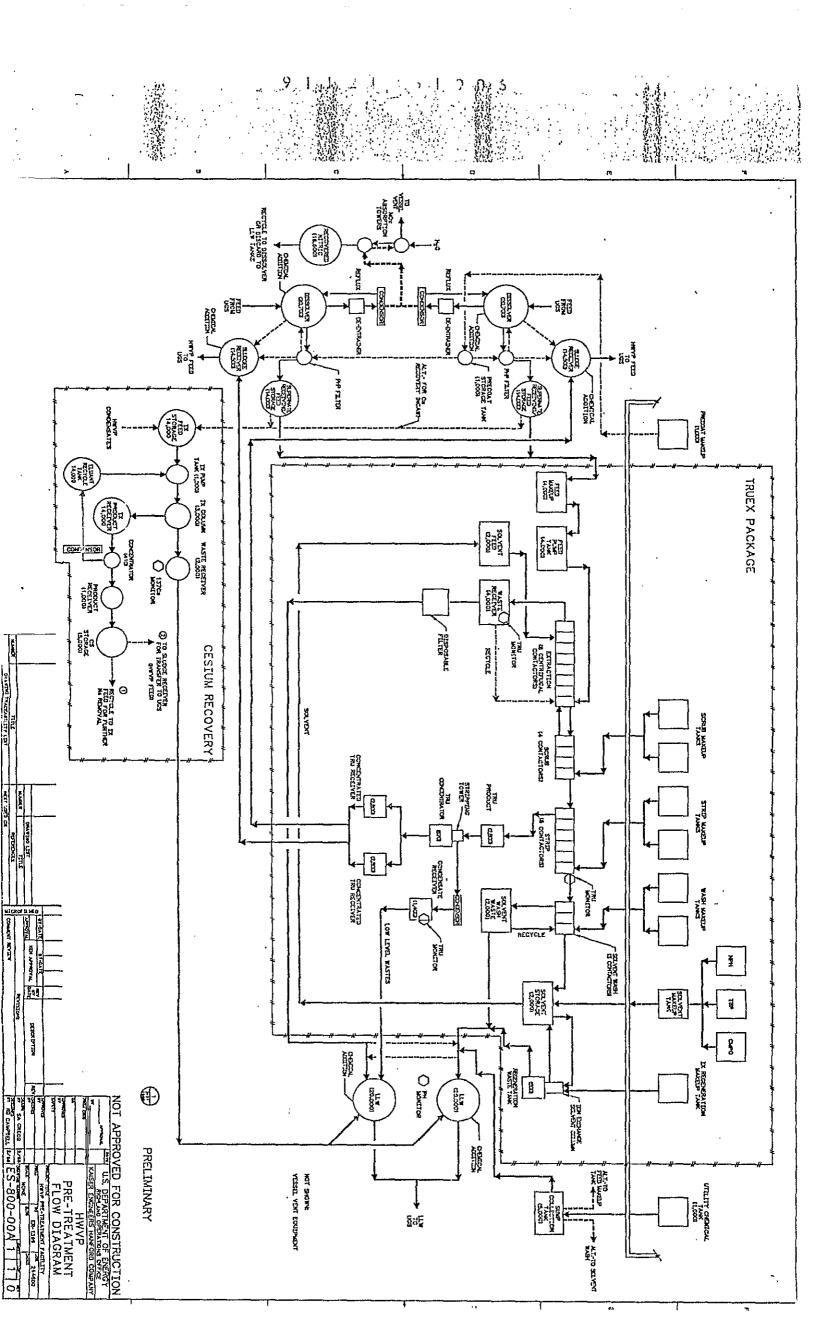
TOTAL WBS 330001 WHC PROJECT MANAGEMENT 0 0 13,000,000 0 13,000,000

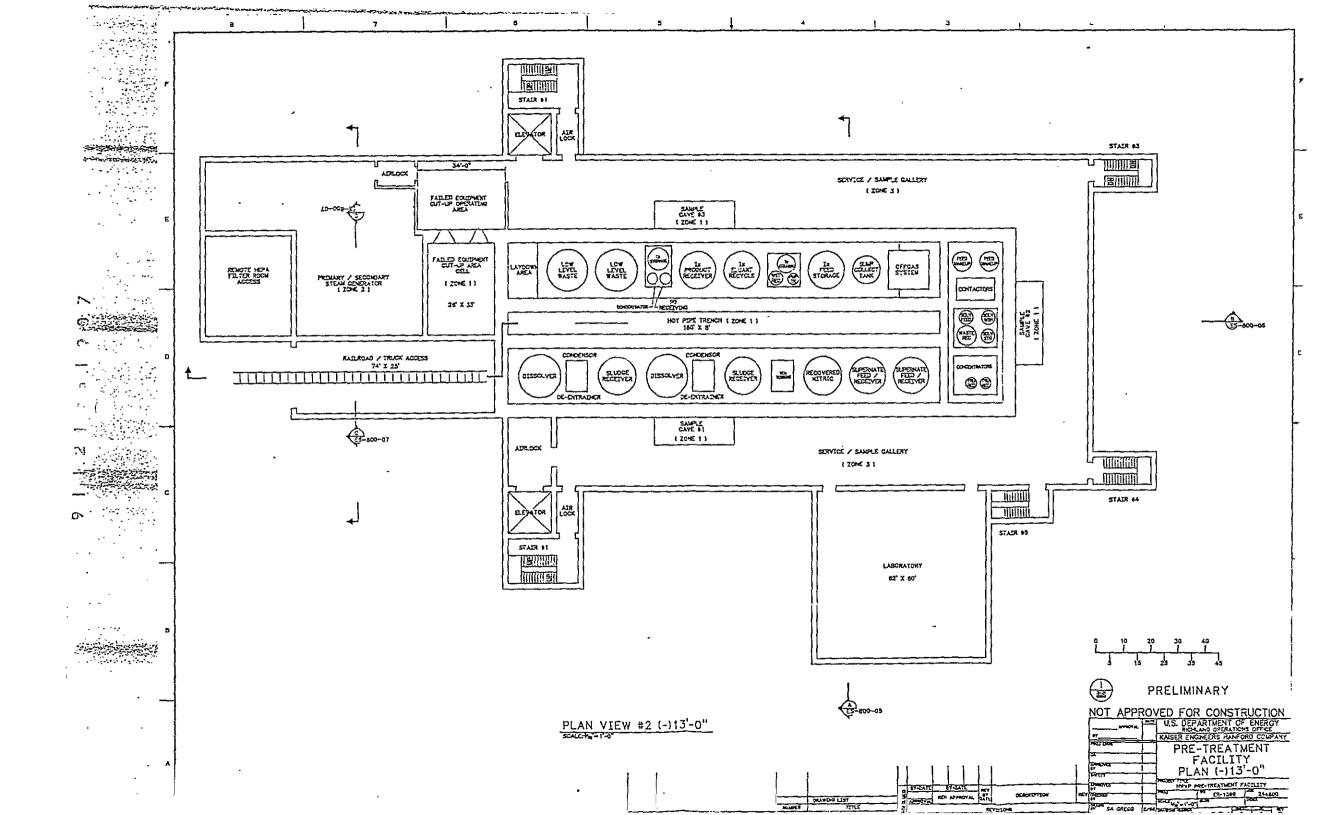
1 2 1 1 1 1 1 1 1 1 1 1

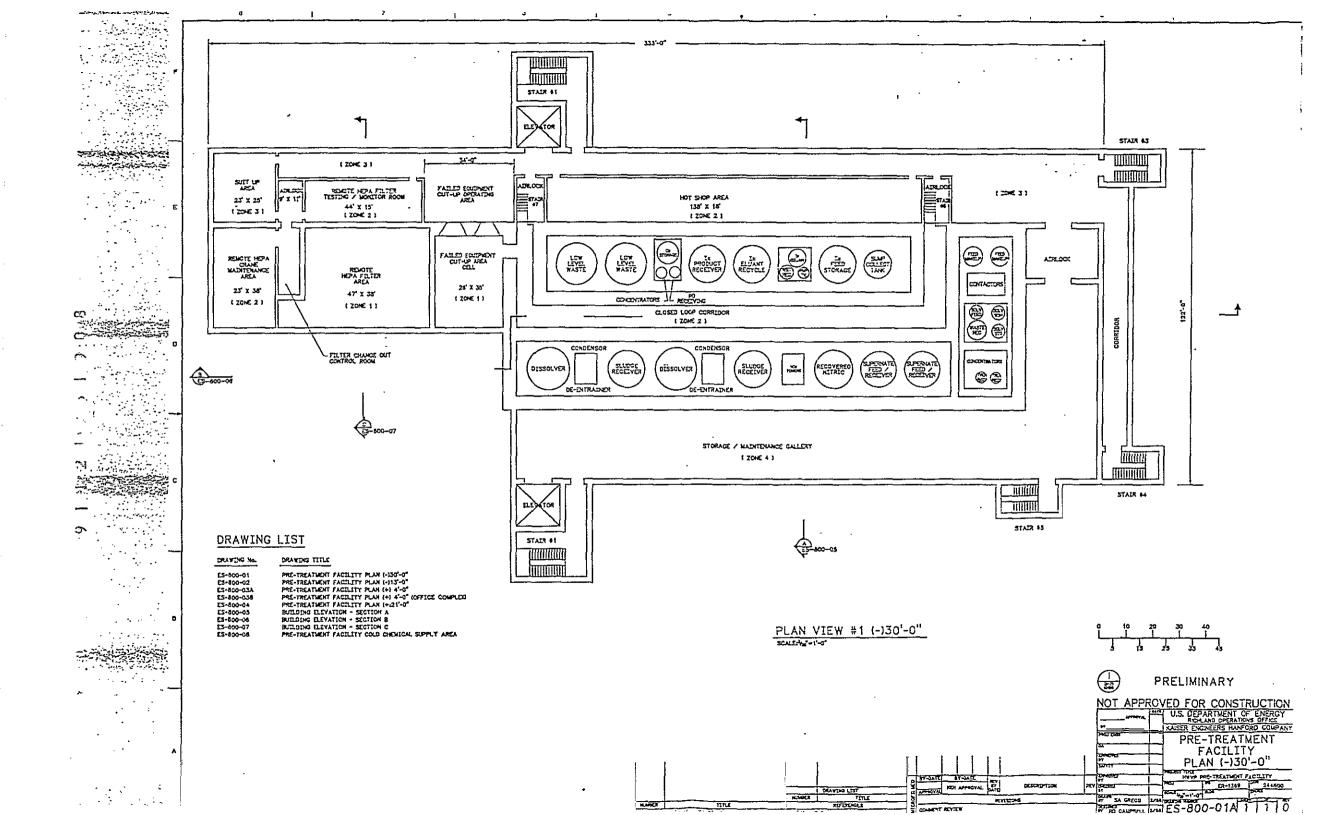
KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369 ** KAISER ENGINEERS INTERACTIVE ESTIMATING **
PRETREATMENT FACILITY
PARAMETRIC - ROUGH ORDER OF MAGNITUDE
KEHROB - ESTIMATE DETAIL BY WBS / COST CODE

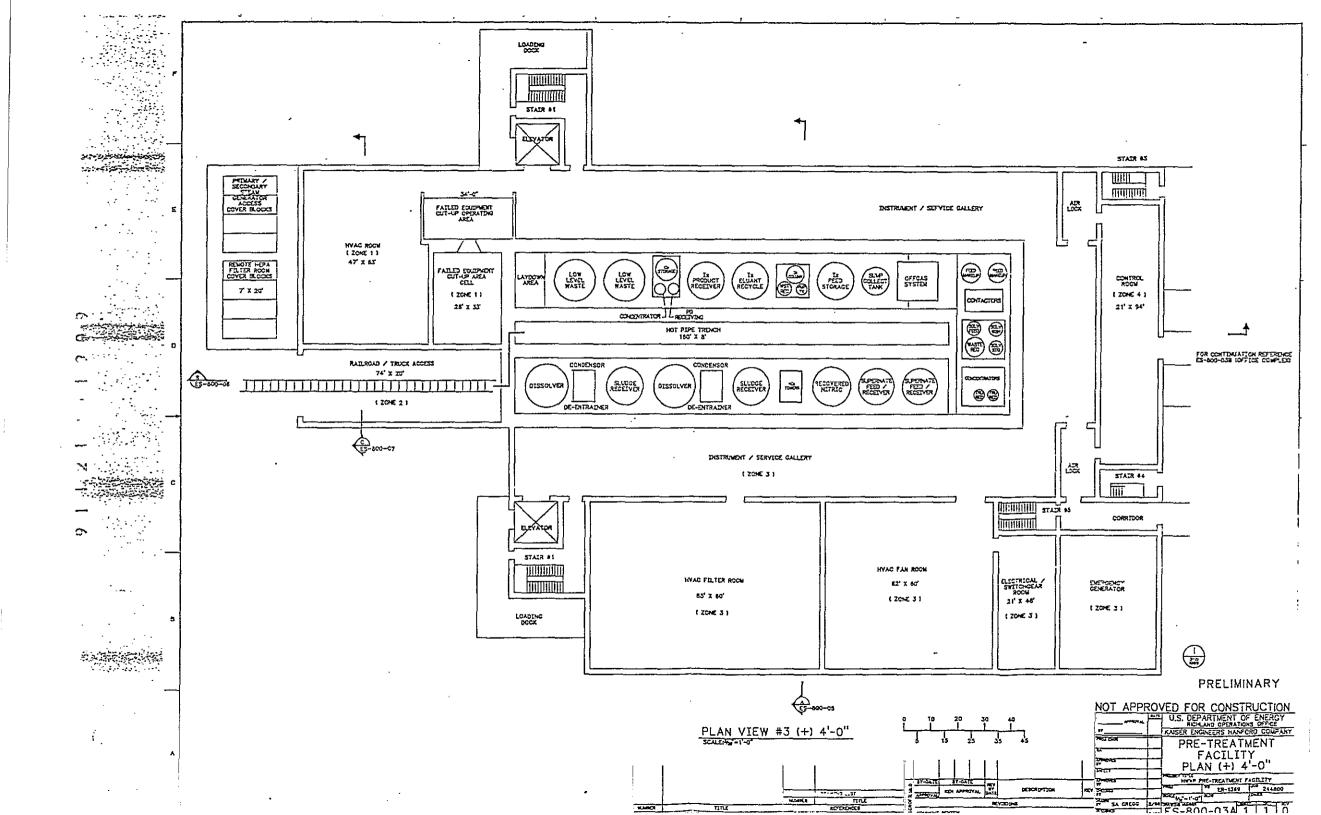
PAGE 0007 DATE 03/03/89 01:20 BY F.C. DAY

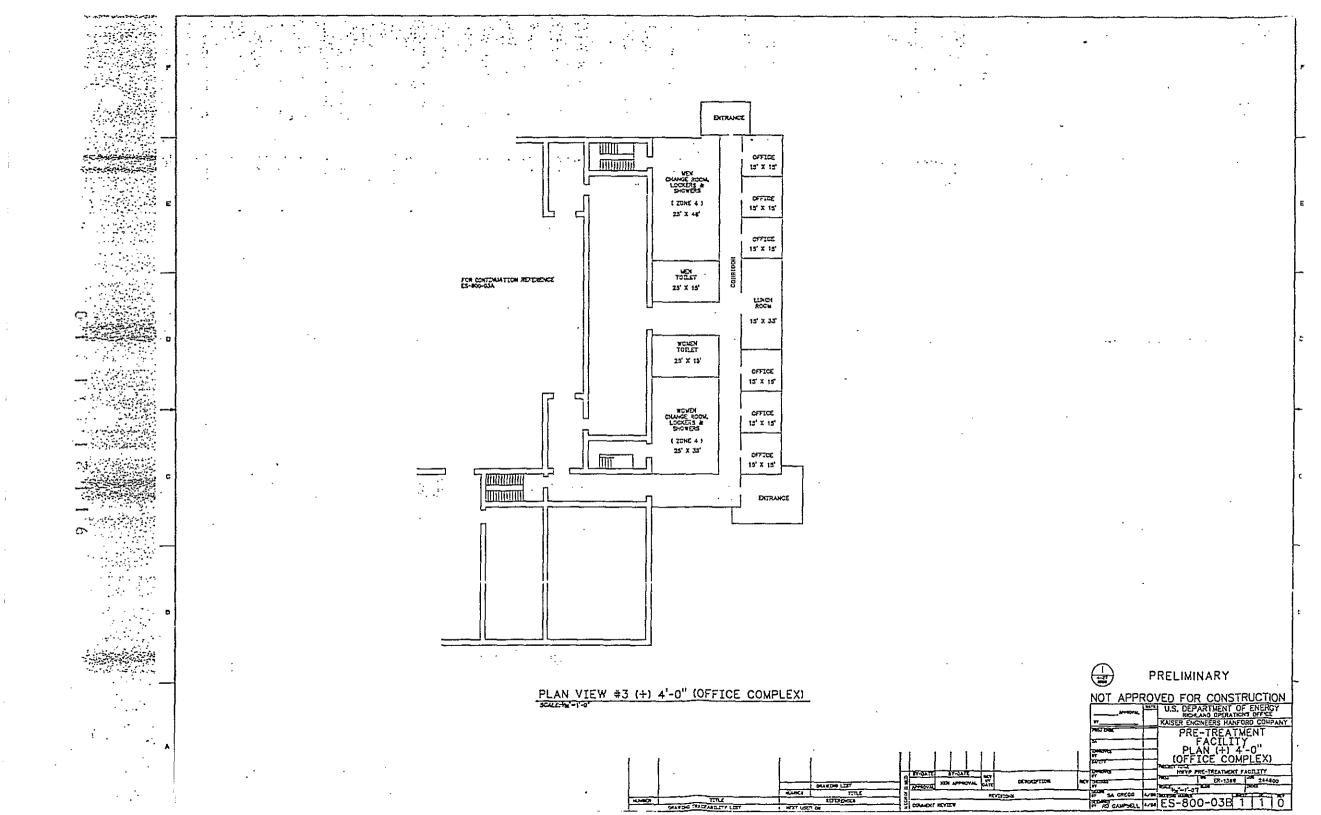
ACCOUNT NUMBER DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR		MATERIAL		EQUIP- MENT	OH&P / B & 1 =======	DOLLARS
REPORT TOTAL			0	0	0	192 0	2,900,000	0	0 1:	92.900.000

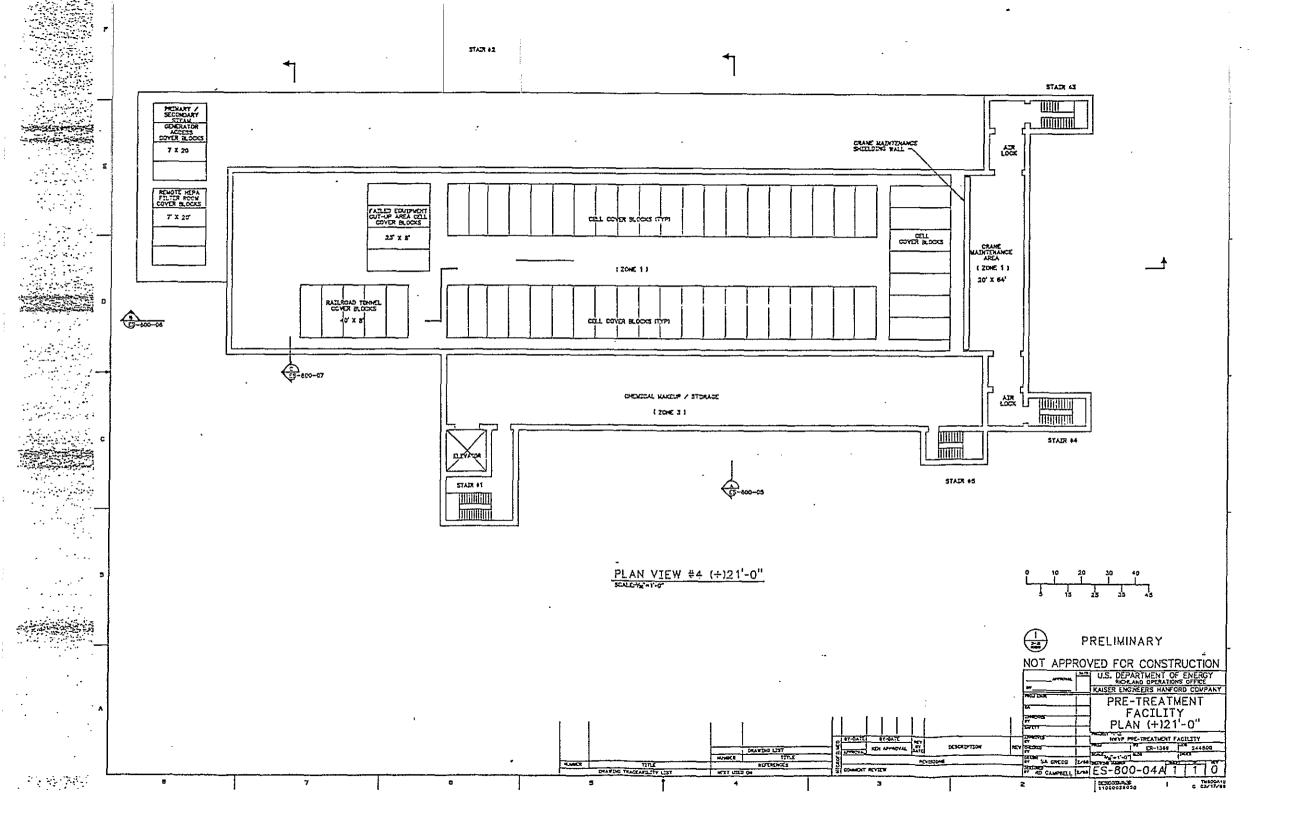


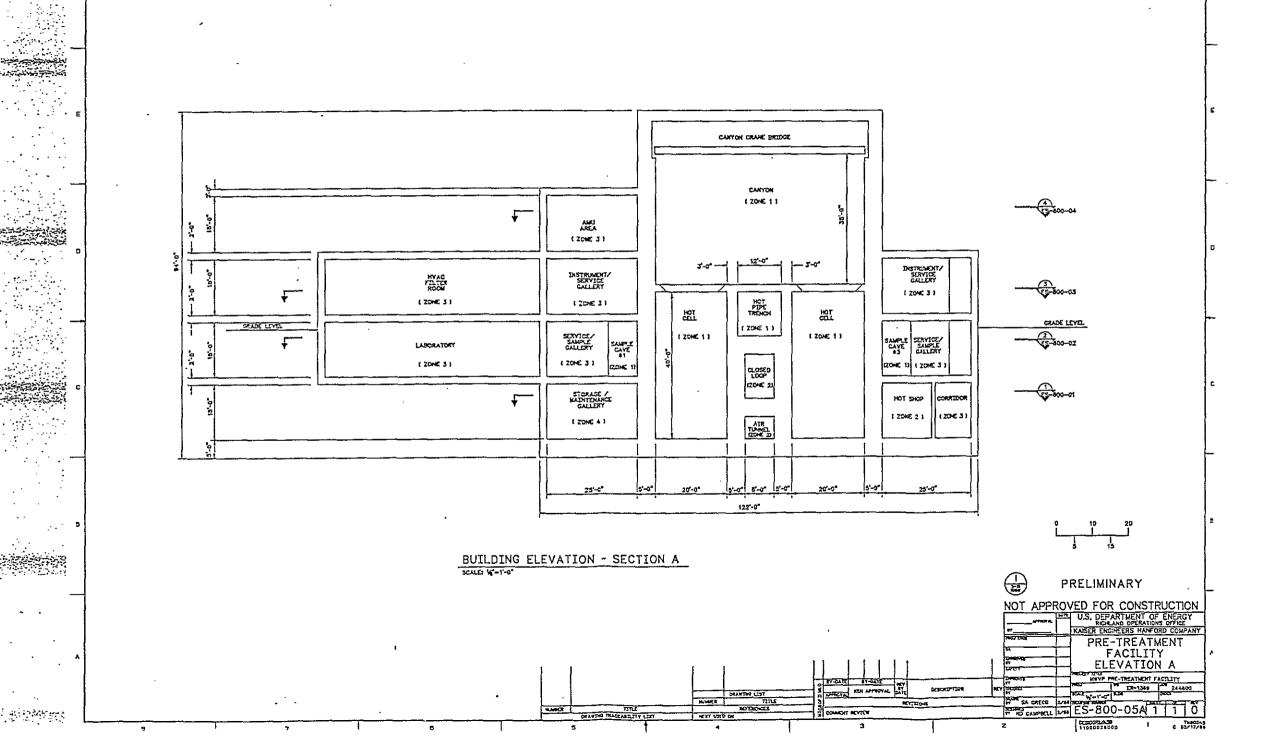


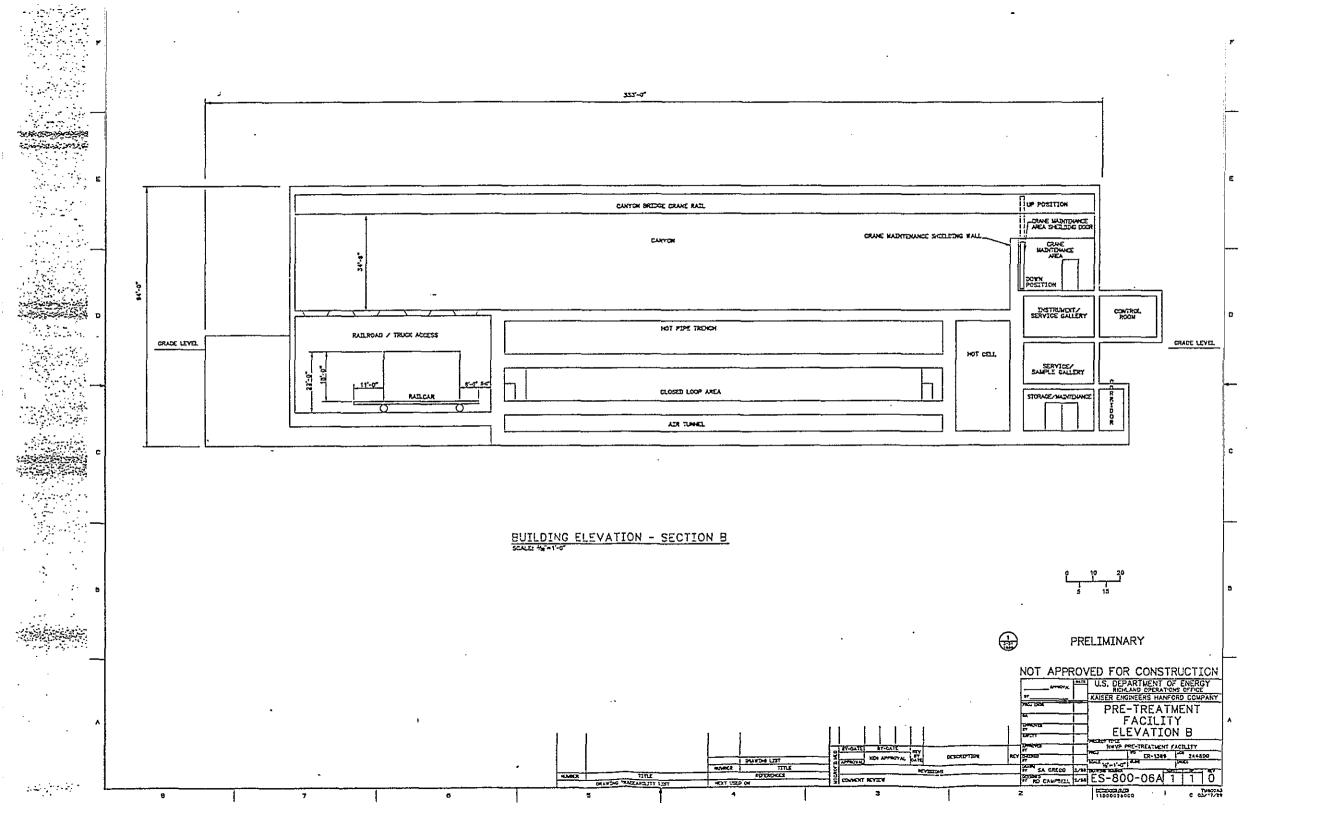


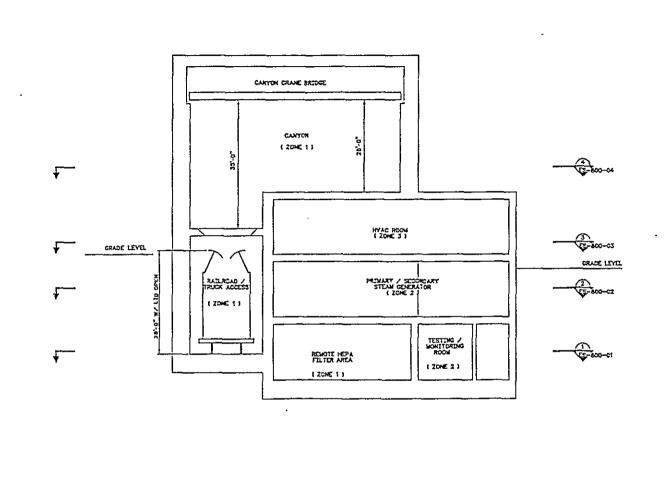




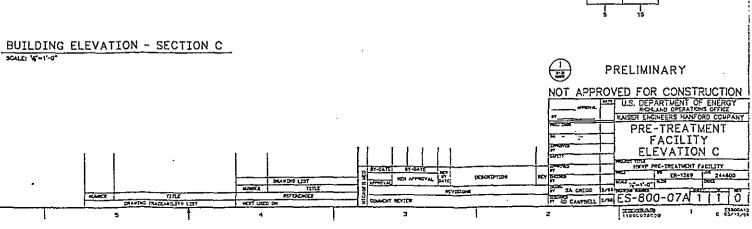


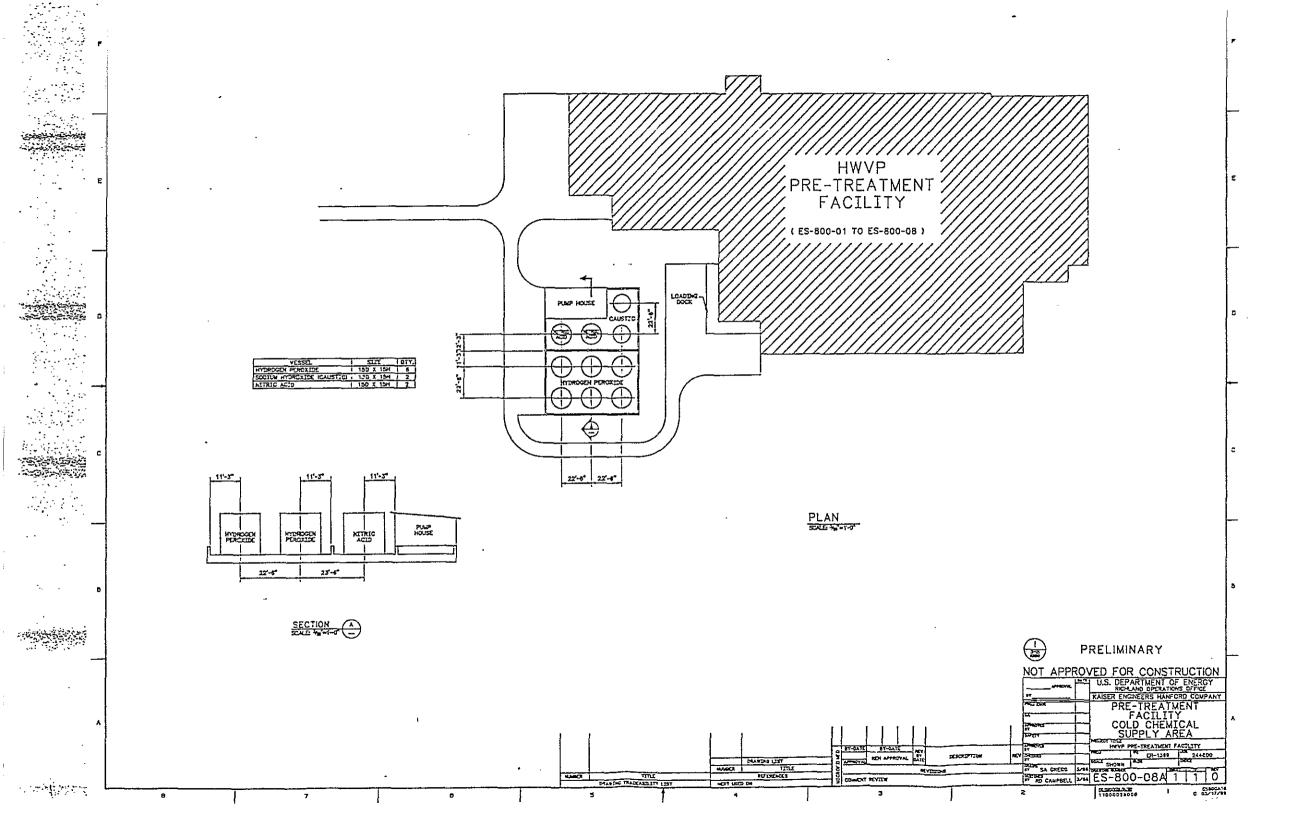






SCALE: 15"-1"-0"





Attachment 2
Pretreatment 175,000²

PRETREATMENT

(-) 30'-0" Level Stairwell 32 x 16 512 x 60 30,720 Stairwell 10 x 21 210 x 60 12,600 Remote HEPA Crane Maint Area 42 x 23 966 x 15 14,490 Suit Up Area 25 x 23 575 x 15 8,625 Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 Filter Change Out Cont Room 18 x 11 198 x 15 2,970 Air Lock/Corridor 70 x 11 770 x 15 11,550 FECA Operating Area 34 x 25 850 x 15 12,750	·	AREA					VOLUME	
. Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Remote HEPA Crane Maint Area 42 x 23 966 x 15 14,490 . Suit Up Area 25 x 23 575 x 15 8,625 . Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 . Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550								
. Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Remote HEPA Crane Maint Area 42 x 23 966 x 15 14,490 . Suit Up Area 25 x 23 575 x 15 8,625 . Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 . Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550								
. Stairwell 10 x 21 210 x 60 12,600 . Stairwell 10 x 21 210 x 60 12,600 . Remote HEPA Crane Maint Area 42 x 23 966 x 15 14,490 . Suit Up Area 25 x 23 575 x 15 8,625 . Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 . Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550								
. Stairwell . Remote HEPA Crane Maint Area . Suit Up Area . Remote HEPA Filter Test/Monitor . Filter Change Out Cont Room . Air Lock/Corridor . Stairwell . 21								
. Remote HEPA Crane Maint Area 42 x 23 966 x 15 14,490 . Suit Up Area 25 x 23 575 x 15 8,625 . Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 . Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550								
. Suit Up Area 25 x 23 575 x 15 8,625 . Remote HEPA Filter Test/Monitor 44 x 15 660 x 15 9,900 . Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550								
. Remote HEPA Filter Test/Monitor								
. Filter Change Out Cont Room 18 x 11 198 x 15 2,970 . Air Lock/Corridor 70 x 11 770 x 15 11,550	. Remote HEPA Filter Test/Monitor	44	X	15	660 x		9,900	
The state of the s	. Filter Change Out Cont Room							
FECA Operating Area 34 X 25 850 X 15 12,750								
. FECA Cell 39 x 25 975 x 15 14,625 . Remote HEPA Filter Area 47 x 42 1,974 x 15 29,610								
11 x 15 165 x 15 2,475	. Remote HERA Filter Area							
. Hot Shop/Air Lock/Corridor 312 x 25 7,800 x 15 117,000	Hot Shop/Air Lock/Corridor							
. Storage Maintenance 312 x 25 7,800 x 15 117,000	. Storage Maintenance				7,800 x			
. Corridor/Air Lock 72 x 25 1,800 x 15 27,000			X				-	
. Narrow Corridor 100 x 10 1,000 x 15 15,000	. Narrow Corridor							
Elevator 25 x 20 500 x 45 - 22,500								
. Cell A 224 x 20 4,480 x 40 179,200								
. Cell B 224 x 20 4,480 x 40 179,200 . Cell C 25 x 20 500 x 40 20,000								
. Cell C 25 x 20 500 x 40 20,000 25 x 20 500 x 40 20,000	. Leff C							
62 x 20 1,240 x 40 49,600	•							
. Air Tunnel 252 x 12 3,024 x 6 18,144	Air Tunnel							
. Closed Loop Area 252 x 12 3,024 x 12 36,288					3,024 x		36,288	
Subtotal 44,633 FT ² 989,047 FT ³					44,633 FT ²		989,047 FT ³	
(-) 13'-0" Level	(-) 13'-0" Level							
. Primary/Secondary Steam Gen $47 \times 67 = 3,149 \times 15 = 47,235$. Primary/Secondary Steam Gen							
34 x 23 782 x 15 11,730	- 17 /T 1 A							
. Rail/Truck Access 74 x 25 1,850 x 31 57,350 . Sample Gallery 312 x 25 7,800 x 15 117,000							•	
. Sample Gallery 312 x 25 7,800 x 15 117,000 . Sample Gallery 312 x 25 7,800 x 15 117,000								
. Sample Gallery $72 \times 25 = 1,800 \times 15 = 27,000$								
. Laboratory 62 x 60 3,720 x 15 55,800								
Elevator 25 x 20 500 x 45 22,500		25						
. Elevator 32 x 16 512 x 45 23,040	. Elevator		X					
. FECA Operating Area 34 x 25 850 x 15 12,750								
. FECA Cell 26 x 37 962 x 15 14,430								
. Hot Pipe Trench 12 x 250 3,000 x 12 36,000 . Remote HEPA Filter Room 40 x 32 1,280 x 15 19,200								
. Remote HEPA Filter Room 40 x 32 1,280 x 15 19,200 Subtotal 34,005 FT ² 561,035 FT ³		40	X	52	34.005 FT ²	10	561.035 FT ³	

⁽¹⁾

(+) 4'-0" Level

	FECA Cell HVAC Room FECA Operating Area Instm/Service Gallery Instm/Service Gallery Instm/Service Gallery Control Room Office Complex HVAC Exhaust Room HVAC Filter Room Mechanical Room Elect/Switchgear Room Emergency Generator	26 67 34 312 312 72 128 128 90 85 62 48	x x x x x x x	37 47 25 25 25 21 50 60 60 21 35	962 3,149 850 7,800 7,800 1,800 2,688 6,400 5,100 3,720 1,302 1,680	x x x x x x x x x x x x	15 15 15 15 15 15 15 15 15 15 15 15 15 1	14,430 47,235 12,750 117,000 117,000 40,320 96,000 81,000 76,500 55,800 19,530 25,200	2
Sub	total				48,651	FT		729,765	FT ³
(+)	21'-0" Level								
•	Chem/Make Up Storage Chem/Make Up Strorage Crane Maintenance Canyon Deck total	312 312 64 360	X		7,800 ; 7,800 ; 1,280 ; 22,320 ; 39,200	x x x _	15 15 35 43	117,000 117,000 44,800 959,760 1,238,560	FT ³
(-) (-)	13'-0" Level 4'-0" Level 21'-0" Level	44,633 34,005 48,651 39,200 166,489	FT ²	<u>1.</u> 3,	989,047 561,035 729,765 238,560 518,407	(3.5m	FT ³)		

RDC:tst

175,00071 - 11111 17.

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY

PAGE 1 OF 6 DATE 02/20/89 04:01 BY F.C. DAY

KEHRO1 - PROJECT COST SUMMARY

COST		ESCALATED	CONTIN	GENCY	TOTAL
CODE	DESCRIPTION	TOTAL COST	%	TOTAL	DOLLARS
=====	=======================================	==========	###==	#6555##655#	=========
000	ENGINEERING	97,510,000	35	34,130,000	131,640,000
460	IMPROVEMENTS TO LAND	5,430,000	35	1,900,000	7,330,000
501	BUILDINGS	314,860,000	35	110,200,000	425,060,000
	(ADJUSTED TO MEET DOE 5100.4)			-30,000	-30,000
		=======================================	========		=========
PR	OJECT TOTAL	417,800,000	35	146,200,000	564,000,000

TYPE OF ESTIMATE	REMARKS:
ARCHITECT AND ENGINEER AND	
OPERATING CONTRACTOR	

7 ? 3

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHROZ - WORK BREAKDOWN STRUCTURE SUMMARY

PAGE 2 OF 6 DATE 02/20/89 04:01 BY F.C. DAY

•	· •	ESTIMATE	OTHER	SUB	ESCALATION	SUB	CONTINGENCY	TOTAL
	WBS DESCRIPTION	TOTAL	INDIRECTS	TOTAL	% TOTAL	TOTAL	% TOTAL	DOLLARS
-	=======================================	=== ======	=========	=======	======	# ==##====	**=== ***====	=======
	. 110000 DEFINITIVE DESIGN	36760900	0	36760900	38.75 1424484	9 51005749	35 17852012	68857761
-	120000 ENGINEERING/INSPECTION	14406300	0	14406300	68.25 983230	0 24238600	35 8483510	32722110
	130000 ENGINEERING MANAGEMENT	13909500	0	13909500	60.05 835265	5 22262155	35 7791754	30053909
	SUBTOTAL 1 ENGINEERING	65076700	0	65076700	49.83 3242980	3 97506503	35 34127276	131633779
	320000 FP CONSTRUCTION	165589800	14918082	180507882	62.50 *****	* 293325308	35 ******	395989166
٠	330000 WHC PROJECT MANAGEMENT	16848700	0	16848700	60.05 1011764		35 9438221	36404565
	SUBTOTAL 3 CONSTRUCTION	182438500	14918082	197356582	62.29 *****	* 320291653	35 ******	. 432393731
	· · · · · · · · · · · · · · · · · · ·	=======================================	##===###====	.=========			****************	==========
	PROJECT TOTAL		14,918,082		155,364,87		146,229,355	F / / 037 F 40
-		247,515,200	2	62,433,282	59.20	417,798,156	35	564,027,510

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO4 - COST CODE ACCOUNT SUMMARY

PAGE 4 OF 6 DATE 02/20/89 04:01 BY F.C. DAY

	COST CODE WBS DESCRIPTION	ESTIMATE SUB Total	OTHER INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
	000 ENGINEERING						-	
. :	110000 DEFINITIVE DESIGN 120000 ENGINEERING/INSPECTION 130000 ENGINEERING MANAGEMENT	36760900 14406300 13909500	0 0 0	36760900 14406300 13909500	38.75 14244849 68.25 9832300 60.05 8352655	51005749 24238600 22262155	35 17852012 35 8483510 35 7791754	68857761 32722110 30053909
	TOTAL 000 ENGINEERING	65076700	0	65076700	49.83 32429803	97506503	35 34127276	131633779
	460 IMPROVEMENTS TO LAND							-
•	320000 FP CONSTRUCTION	3064200	275778	3339978	62.50 2087486	5427464	35 1899612	7327077
	TOTAL 460 IMPROVEMENTS TO LAND	3064200	275778	3339978	62.50 2087486	5427464	35 1899612	7327077
•		•						
- 1	501 BUILDINGS							
	320000 FP CONSTRUCTION 330000 WHC PROJECT MANAGEMENT	162525600 16848700	14642304 0	177167904 16848700	62.50 ******* 60.05 10117644	287897844 26966344	35 ******* 35 9438221	388662089 36404565
3.	TOTAL 501 BUILDINGS	179374300	14642304	194016604	62.29 *******	314864188	35 ******	425066654
15 7.0 8.0 25 72 8		*=====	: = = = = = = = = = = = = = = = = = = =		= * = = = = = = = = = = = = = = = = = =	:==#====#==		**====
	PROJECT TOTAL 2	47,515,200	14,918,082	262,433,282	155,364,874 59.20	*****	******** 35	564,027,510
3 (d)								
4								
						•		
	•							

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KAISER ENGINEERS HANFORD
 WESTINGHOUSE HANFORD COMPANY
 JOB NO. ER1369

** KAYSER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO5 - ESTIMATE SUMMARY BY CSI DIVISION

PAGE 5 OF 6 DATE 02/20/89 04:01 BY F.C. DAY

CSI DIV DESCRIPTION	ESTIMATE SUB TOTAL	OTHER INDIRECTS	SUB TOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	TOTAL DOLLARS
ENGINEERING							
ENGINEERING	65076700	0	65076700	49.83 32429803	97506503	35 34127276	131633779
TOTAL ENGINEERING	65076700	0	65076700	49.83 32429803	97506503	35 34127276	131633779
CONSTRUCTION							
02 SITEWORK	3064200	275778	3339978	62.50 2087486	5427464	35 1899612	7327077
03 CONCRETE	65676700	5910903	71587603	62.50 44742252	116329855	35 40715449	157045304
15 MECHANICAL	96848900	8731401	105580301	62.50 65987688	171567989	35 60048796	231616785
20 BURNOUT	16848700	0	16848700	60.05 10117644	26966344	35 9438221	36404565
TOTAL CONSTRUCTION	182438500	14918082	197356582	62.29 ******	320291653	35 ******	432393731
PROJECT TOTAL	**====* *	======== 14,918,082		155,364,874	******	**************************	======================================
²	47,515,200	2	62,433,282	59.20		33	564,027,510

7 1 1 2 1 1 1 3 3 3

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO7 - ONSITE INDIRECT COSTS BY WBS

PAGE 6 OF 6 DATE 02/20/89 04:01 BY F.C. DAY

	WB\$	DESCRIPTION	ESTIMATE SUB Total =======	CONTRACT % =====	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS =======
	110000	DEFINITIVE DESIGN	36760900	0.00	0	0	0	0
		ENGINEERING/INSPECTION	14406300	0.00	0	0	0	0
		ENGINEERING MANAGEMENT	13909500	0.00	Ó	0	0	0
		FP CONSTRUCTION	165589800	9.00	14903082	15000	0	14918082
		WHC PROJECT MANAGEMENT	16848700	0.00	0	0	0	0
		=	=======================================	=======================================			=======================================	*===**====
•	PROJEC	T TOTAL	247,515,200			15,000		14,918,082
			• • • • •		14,903,082	•	0	
:	PROJEC	T TOTAL	247,515,200		14,903,082	15,000	0	14,918,08

1 2 3 4

KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0001 DATE 02/20/89 04:01 BY F.C. DAY

: :	ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY		LABOR		MATERIAL		EQUIP- MENT	OH&P / B & I ======	TOTAL DOLLARS
	110000	DEFINITIVE DESIGN										
	110000.00	TECHNICAL SERVICES										
	110000.000010	2 DEFINITIVE DESIGN	000	1 LS	0	0	0	0	36760900	0	0	36760900
	SUBTOTAL	TECHNICAL SERVICES			0	0	0	3 0	6,760,900	0	0	6,760,900
	TOTAL	COST CODE 00000 WBS 110000			0	0	0	3	6,760,900	0	0	6,760,900
		(ESCALATION 38.75% - CONTINGE	NCY 35	(.00%)								
	TOTAL WBS 1	10000 DEFINITIVE DESIGN			0	0	0	3 0	6,760,900	0	0	36,760,900
												•
4 T												
I . '	;											

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

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** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KERRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0002 DATE 02/20/89 04:01 BY F.C. DAY

	ACCOUNT NUMBER	DESCRIPTION	COST CODE ====	YTITHAUP	MANHOURS	LABOR	EQUIP USAGE	MATERIAL CO	SUB- NTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
	120000	ENGINEERING/INSPECTION										
4	120000.00	TECHNICAL SERVICES										
	120000.0000100	ENGINEERING/INSPECTION	000	1 LS	0	0	0	0 14	406300	0	0	14406300
•	SUBTOTAL	TECHNICAL SERVICES			0	0	0	14,4 0	06,300	0	0	4,406,300
:	TOTAL	COST CODE 00000 WBS 120000			0	0	0	14,4 0	06,300	0	0	4,406,300
		(ESCALATION 68.25% - CONTINGE	NCY 35	.00%)							·	
:												
	TOTAL WBS 12	20000 ENGINEERING/INSPECTION			0	0	0	14,4 0	06,300	0	0	14,406,300

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KAISER ENGINEERS HANFORD WESTINGHOUSE HANFORD COMPANY JOB NO. ER1369

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0003 DATE 02/20/89 04:01 BY F.C. DAY

	ACCOUNT NUMBER	DESCRIPTION	COST CODE ===x	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
-	130000	ENGINEERING MANAGEMENT										
	130000.00	TECHNICAL SERVICES										
	130000.0000100	ENGINEERING MANAGMENT	000	1 LS	0	0	0	0	13909500	0	0	13909500
;	SUBTOTAL	TECHNICAL SERVICES			0	0	0	1 0	3,909,500	0	0	13,909,500
	TOTAL	COST CODE 00000 WBS 130000		*	0	0	0	1 0	3,909,500	0	0	13,909,500
4		(ESCALATION 60.05% - CONTINGE	NCY 35	.00%)								
:												
•	TOTAL WBS 13	SOOOO ENGINEERING MANAGEMENT			0	0	0	1 0	3,909,500	0	0	13,909,500

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY

PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE PAGE 0004 DATE 02/20/89 04:01 BY F.C. DAY

ACCOUNT Number =========	DESCRIPTION	COST CODE ====	QUANTITY		LABOR		MATERIAL	SUB- CONTRACT	EQUIP- MENT	OH&P / B & I	TOTAL DOLLARS
320000	FP CONSTRUCTION										
320000.02	SITEWORK										
320000.020010	O EXCAVATION - INCLS. THE COST FOR CLEARING & GRUBBING OF	460	1 LS	0	0	0	0	0	0	0	0
320000.020010	SITE, EXCAVATION AND 2 BACKFILL FOR THE BUILDING	460	1 LS	0	0	0	0	3064200	0	0	3064200
SUBTOTAL	SITEWORK	•		0	0	0	0	3,064,200	0	0	3,064,200
TOTAL	COST CODE 46002 WBS 320000	•		0	0	0	0	3,064,200	0	0	3,064,200
	(ESCALATION 62.50% - CONTINGE)	ICY 35.	.00%)								
320000.03	CONCRETE										
320000.030010	O STRUCTURE COST - INCLS. THE EXTERNAL STRUCTURE(WALL FACE S, ROOFING, CONNECTING WALLS	501	1 LS	0	0	0	0	0	0	0	, 0
320000.030010	2 WINDOWS), SUPERSTRUCTURE, & INTERNAL STRUCTURE(WALLS, CEILINGS, FLOORS, DOORS, ETC.)	501	1 LS	0	0	C	0	65676700	0	0	65676700
SUBTOTAL	CONCRETE		, - * * * • • • • • • •	0	0	0	6	5,676,700	0	0	65,676,700
								5,676,700		0	· · · · · · · · · · · · · · · · · · ·
TOTAL .	COST CODE 50103 WBS 320000			0	0		0)	0	1	65,676,700
TOTAL .		NCY 35	.00%)	0			0)	0		os,ora,ruu
TOTAL .	WBS 320000	NCY 35	.00%)	0			0	·	0		,676,700

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE

PAGE 0005 DATE 02/20/89 04:01 BY F.C. DAY

KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

ACCOUNT NUMBER ##====#===##	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB- CONTRACT	EQUIP- MENT ======	OH&P / B & I	TOTAL DOLLARS ========
320000.15	MECHANICAL										
320000.1500100	HVAC - INCLS. COST FOR THE HEATING, VENTILATING, AIR CONDITIONING, & CONTROLS)	501	1 LS	0	0	0	0	15215600	0	0	15215600
320000.1500200	D ELECTROMECHANICAL - INCLS. THE COST FOR ELECTRICAL, PLUMBING, PIPING, FIRE	501	1 Ls	0	0	0	0	0	0	0	0
320000.150020	2 PROTECTION, MECHANICAL EQUIPMENT, & INSTRUMENTATION	501	1 LS	0	0	0	0	78698300	0	0	78698300
320000.150030	O UTILITIES - INCLS THE COST FOR RR TRACK SPUR, 10 OUTSIDE STORAGE TANKS W/CONCRETE	501	1 LS	0	0	0	0	0	0	0	0
320000,150030	2 PAD AND DIKE, MECHANICAL PIPING & EQUIP., INSTRUMENTATION, & PAVING	501	1 LS	0	0	0	0	2935000	0	0	2935000
SUBTOTAL	MECHANICAL			0	0	0	9	6,848,900	0	0	76,848,900
TOTAL	COST CODE 50115 WBS 320000		••••••	0	0	0	9	6,848,900	0	0	96,848,900
	(FSCALATION 62.50% - CONTINGE	NCY 35	.00%)								4

(ESCALATION 62.50% - CONTINGENCY 35.00%)

TOTAL WBS 320000 FP CONSTRUCTION 0 0 165,589,800 0 0 165,589,800

** KAISER ENGINEERS INTERACTIVE ESTIMATING ** PRETREATMENT FACILITY PARAMETRIC - ROUGH ORDER OF MAGNITUDE KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0006 DATE 02/20/89 04:01 BY F.C. DAY

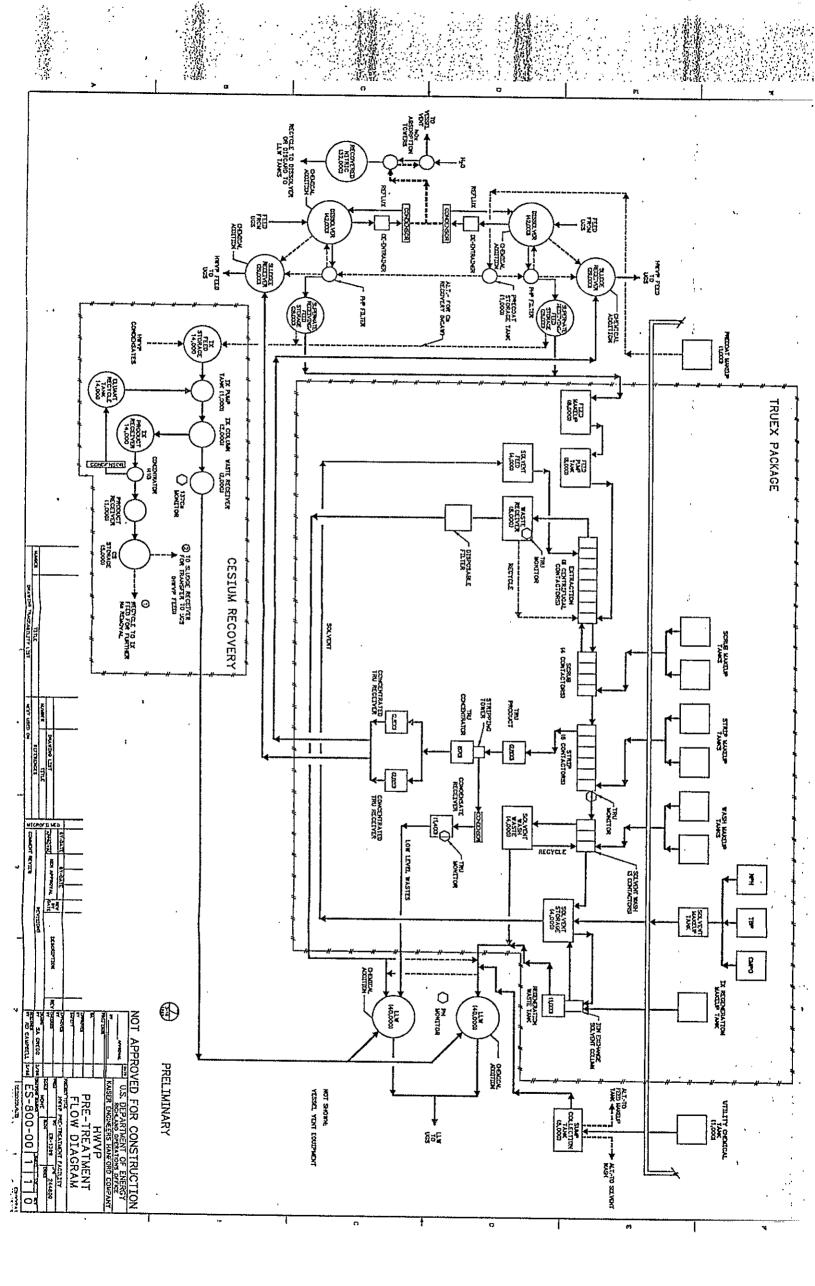
EQUIP-OH&P TOTAL ACCOUNT COST EQUIP SUB-/ B & I DOLLARS QUANTITY MANHOURS LABOR USAGE MATERIAL CONTRACT MENT NUMBER DESCRIPTION CODE 330000 WHC PROJECT MANAGEMENT 330000.20 BURNOUT 330000.2000100 WHC PROJECT MANAGEMENT 501 1 LS 0 16848700 0 16848700 SUBTOTAL BURNOUT 0 0 16,848,700 16,848,700 0 TOTAL COST CODE 50120 16,848,700 WBS 330000 16,848,700 (ESCALATION 60.05% - CONTINGENCY 35.00%).

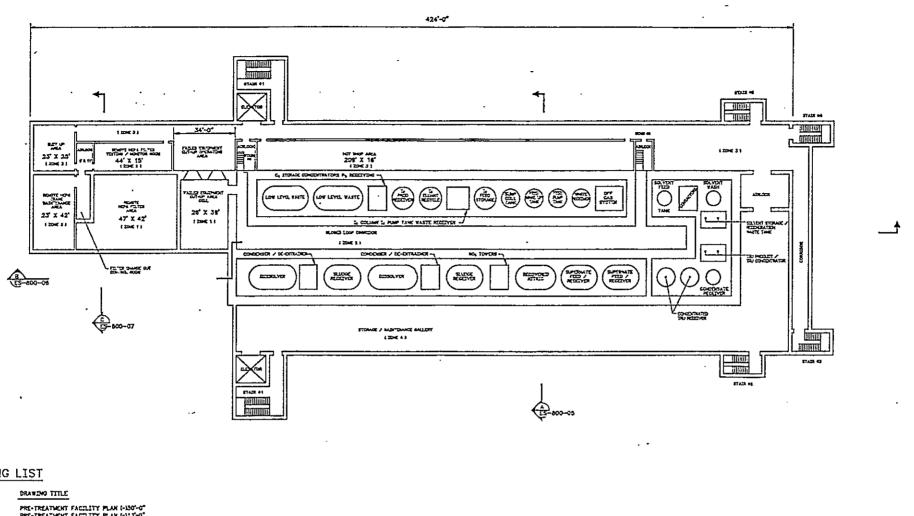
TOTAL WBS 330000 WHC PROJECT MANAGEMENT	0	0	16,848,700	0
		^	o	0 14 049 700

** KAISER ENGINEERS INTERACTIVE ESTIMATING **
PRETREATMENT FACILITY
PARAMETRIC - ROUGH ORDER OF MAGNITUDE
KEHRO8 - ESTIMATE DETAIL BY WBS / COST CODE

PAGE 0007 DATE 02/20/89 04:01 BY F.C. DAY

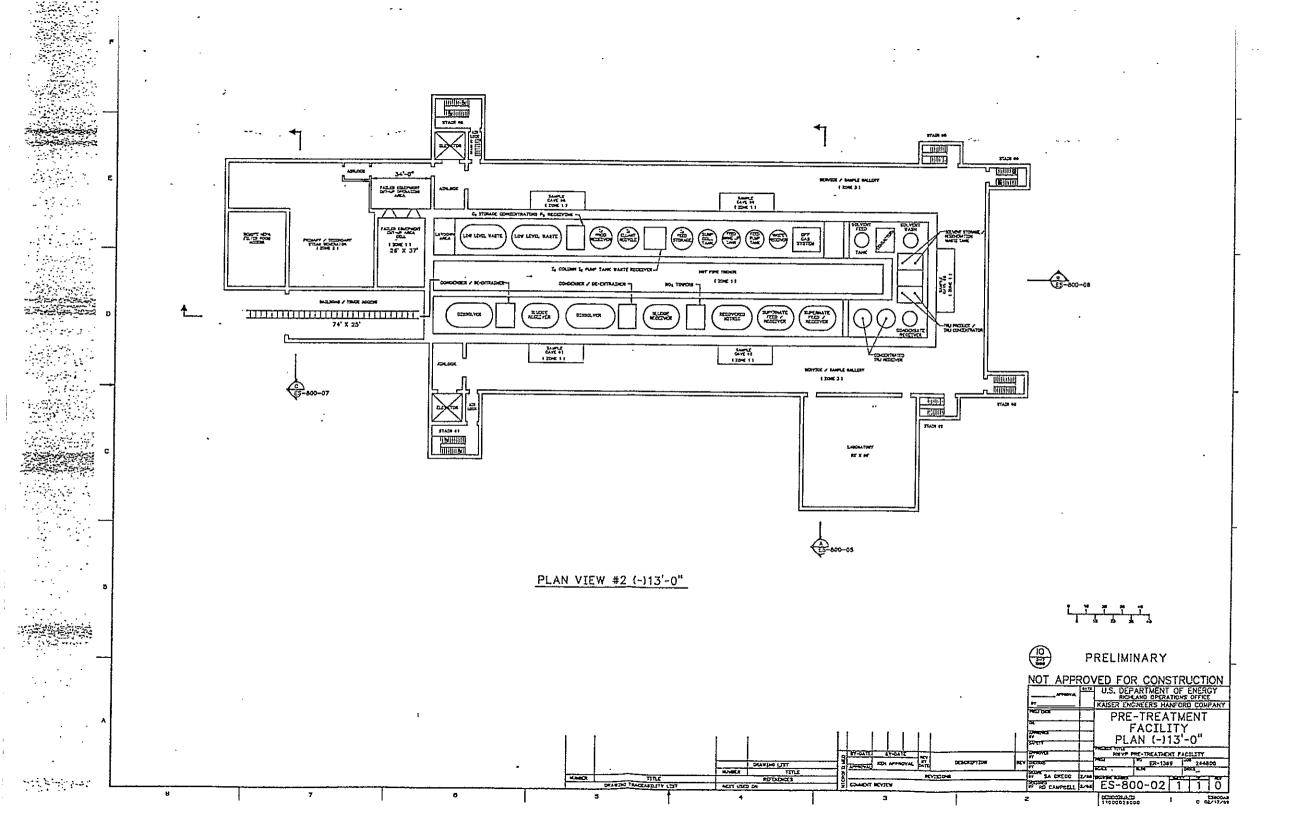
-	ACCOUNT NUMBER	DESCRIPTION	COST CODE ====	QUANTITY	MANHOURS	LABOR		MATERIAL		EQUIP- MENT	OH&P / B & I ·==##==#	TOTAL DOLLARS
	REPORT TOTAL				0	0	0	241	7,515,200	0	0	47.515.200

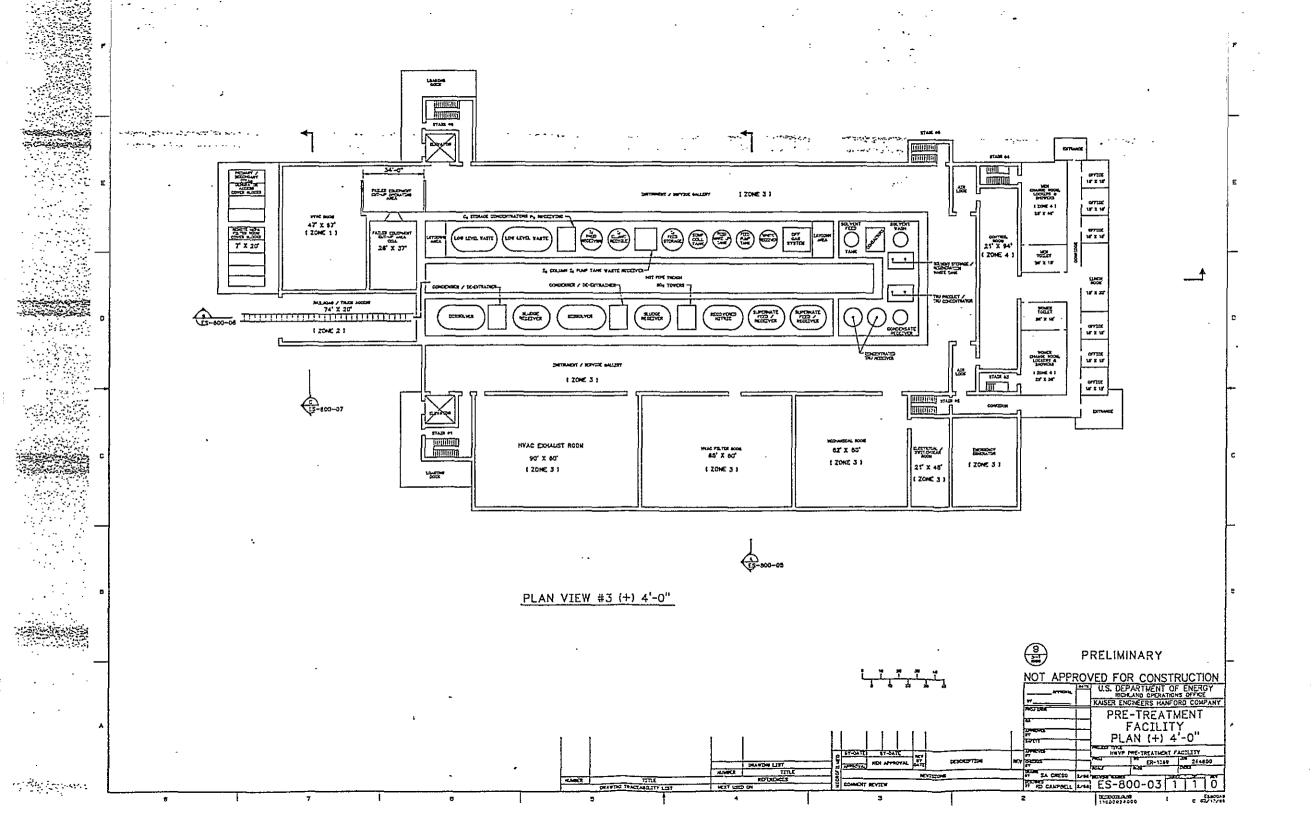


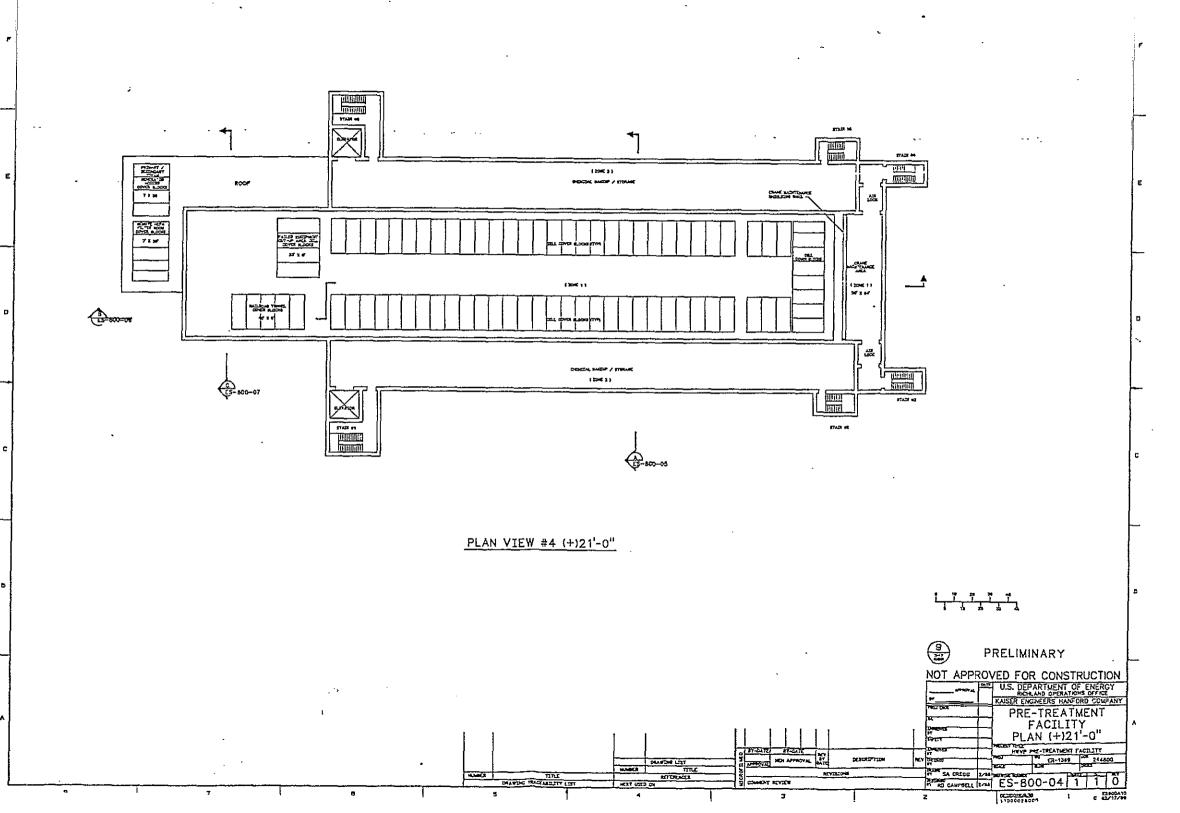


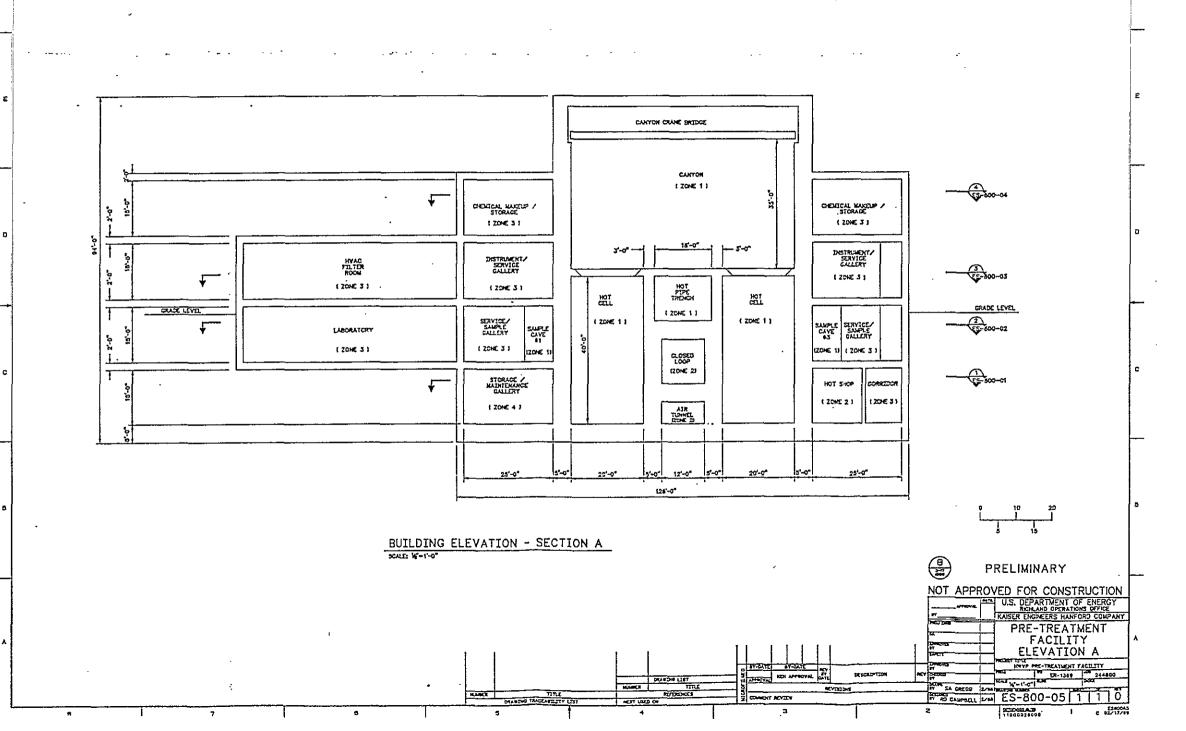
DRAWING LIST

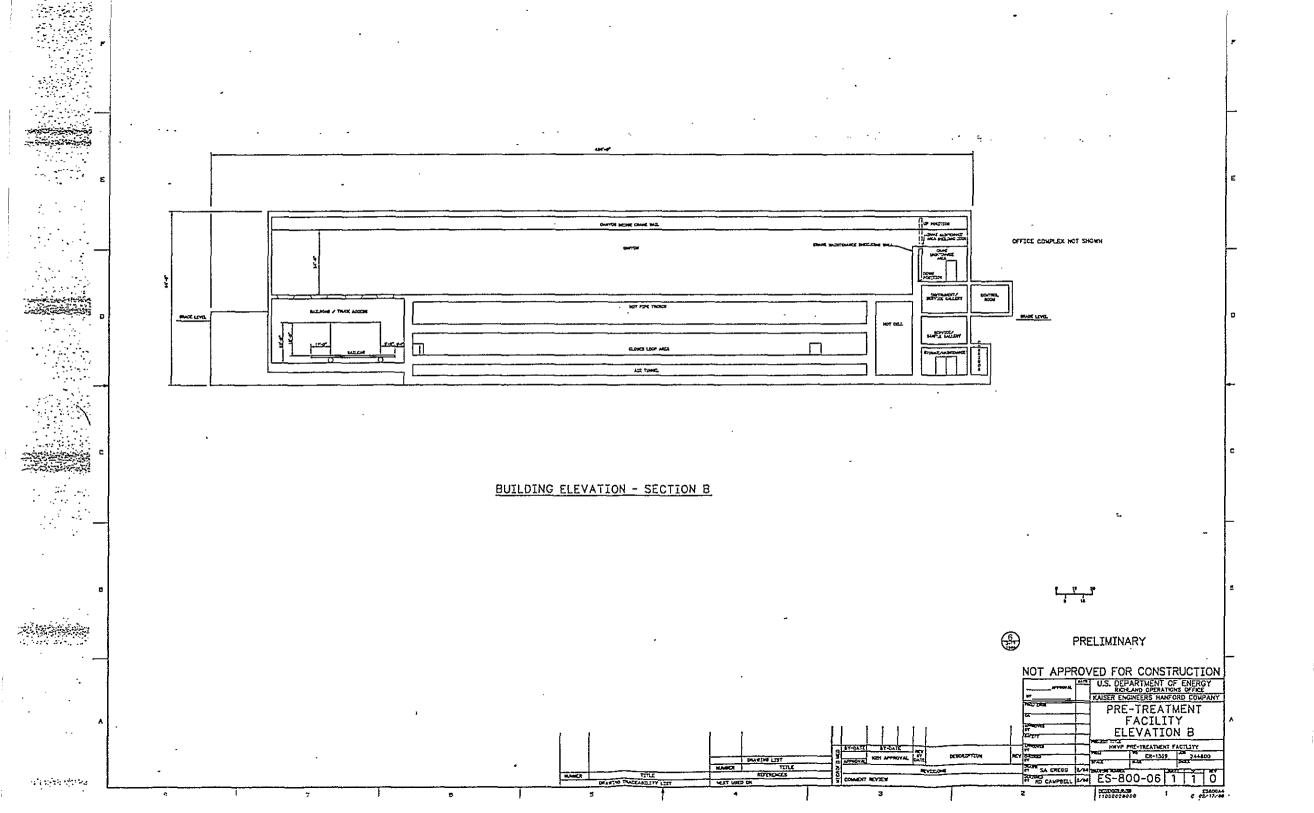
					1
E5-800-01 E5-800-02 E5-800-03 E5-800-05 E5-800-05 E5-800-07 E5-800-08 E5-800-09	PRE-TREATMENT FACILITY PLAN (-ISO'-O' PRE-TREATMENT FACILITY PLAN (+ISO'-O' PRE-TREATMENT FACILITY PLAN (+ISO'-O' PRE-TREATMENT FACILITY PLAN (+ISO'-O' PRE-TREATMENT FACILITY PLAN (+ISO'-O' BUILDING ELEVATION - SECTION 8 BUILDING ELEVATION - SECTION 8 BUILDING ELEVATION - SECTION 6 PRE-TREATMENT FACILITY COLD CHEMICAL SUPPLY ARE PRE-TREATMENT FACILITY COLD CHEMICAL SUPPLY ARE PRE-TREATMENT FACILITY COLD CHEMICAL SUPPLY ARE			PLAN VIEW #1 (-)30'-0"	
			**		PRELIMINARY NOT APPROVED FOR CONSTRUCTION U.S. DEPARTMENT OF ENERGY RAISER ENGINEERS HANGED COMPANY PRE-TREATMENT FACILITY
			MARCE TITLE PROPERTY LS	SCANDER LIST AMERICAL DATE DATE DATE DATE DATE DATE DATE DATE	PLAN (-)30°-0" PLAN (-)30°-0"
8	7	8	5	4	Z 1-00003000 C 02/01/00

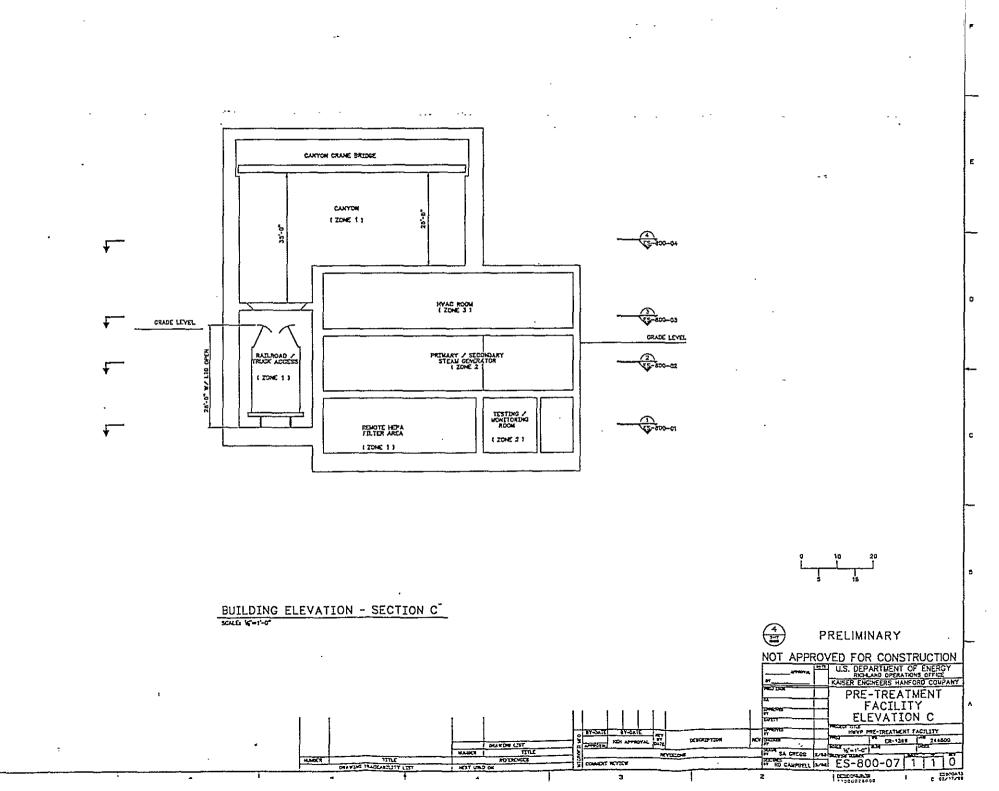


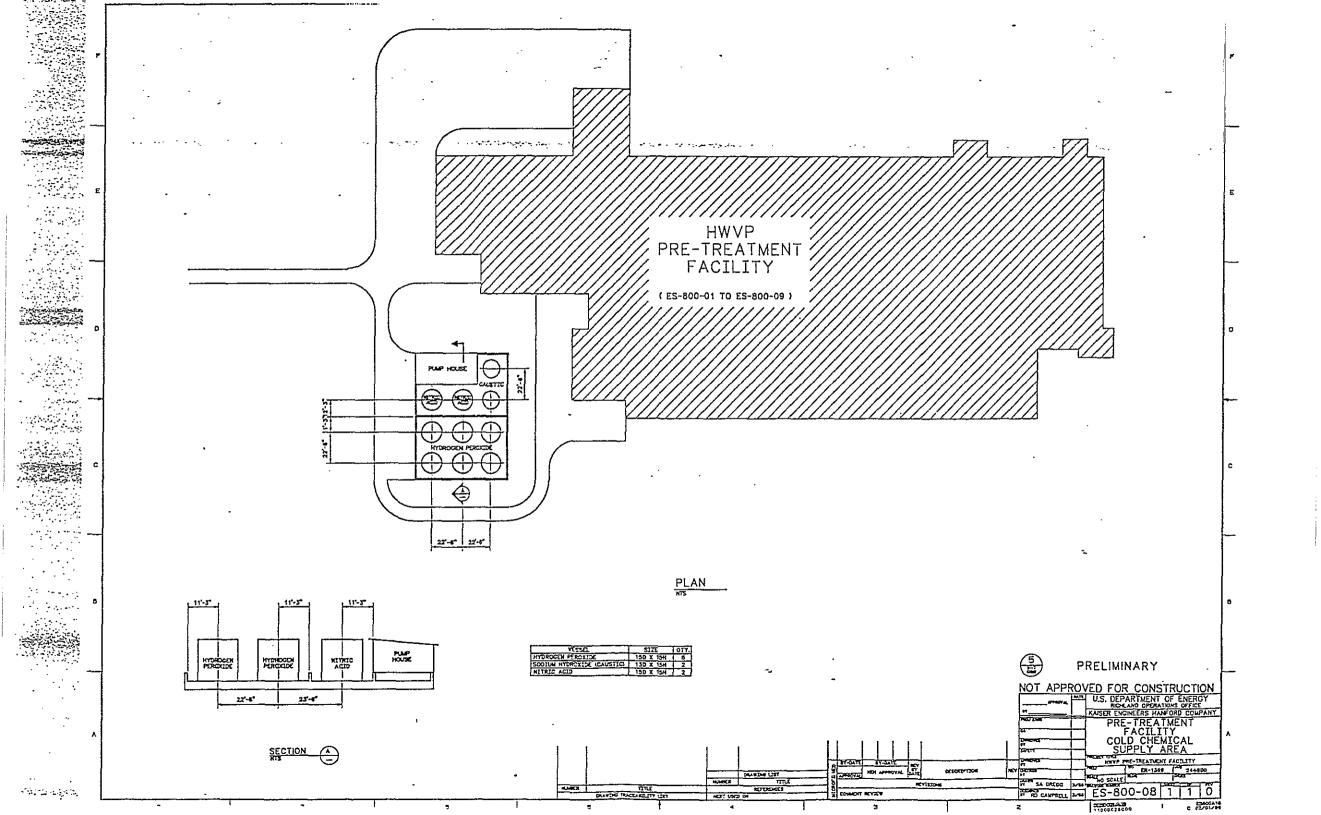












Attachment 3 PFM Building

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PFM BUILDING

DT F1 704 0H				<u>AREA</u>			VOLUME	
Plan EL 79'-0" . Elevator	24	x	- 14	336	x	74	24,864	
. Elev Equip Room	22	X	10	220	x	25	5,500	
. Operating Gallery	148			2,516	X	22	55,352	
•	54 63	X X	17 17	918 1,071	X X	25 28	22,950 29,988	
•	30	X	12	360	X	28	10,080	
. Storage Room	10	X	10	100	X	22	2,200	
. Operating Gallery . Suit-Up Room	104	- X	14 12	1,456 120	X X	22 22	32,032 2,640	
· Sare-op Room	8	x	14	112	X	22	2,464	
. Crane Maint/Container Storage	25	X	15	375	X	36	13,500	
. Assay Room . Waste Loadout	15 25	X X	10 15	150 375	X	14 36	2,100	
. waste Loadout	15	X	10	150	X X	18	13,500 2,700	
. Waste Pkg Cell	39	X	15	585	X	18	10,530	
. Fuel Transfer Canal	52	Х	10	520	X	28	14,560	
. Storage Pit	10 15	X X	12 6	120 90	X X	4 12	480 1,080	
. Cask Unloading Pool -	10	Х	9	90	X	52	4,680	
. Pool Filter Basin	10	X	5	50	X	17	850	
. Testing & Decon Pit . Surge Pool	10 10	X X	10 7	100 70	X X	25 18	2,500	
. FFTF Fuel Storage Pool	32	X	9	288	X	32	1,260 9,216	
. Liquid Waste Collect Room	23	X	36	828	X	34	28,152	
. Doo'l Dump Doom	18	X	30	540	X	34	18,360	
. Pool Pump Room . Suit-Up Room	24 10	X	12 14	288 140	X X	12 10	3,456 1,400	
. Air Lock	10	X	12	120	X	10	1,200	
. Shear Dissolver Cell/Chem Process Cell	148	X	20	2,960	X	78	230,880	
. Failed Equip Cut-Up Area	33	X	20	660	X	78	51,480	
Hot Pipe TrenchOperating Gallery	150 117	X X	8 7	1,200 819	X	20 22	24,000 18,018	
. Operating darrery	16	X	7	112	X X	22	2,464	
. Remote HEPA Filter Room	60	X	20	1,200	X	26	31,200	
. Maintenance Area	10 10	X	5 19	50 190	X X	26 26	1,300 4,940	
. Suit-Up Room	14	X	11	154	x	8	1,232	
. Air Lock	22	X	7	154	X	8	1,232	
. Remote HEPA Filter Testing/Monitoring	62	X	6	372	X	8	2,976	
Room . Corridor	71	x	7	497	x	8	3,976	
. Mezzanine	82	x	14	1,148	x	18	20,664	
. Filter Change-Out Control Room	12	X	7	84	X ET2	8	672	F3.
Subtotal				21,688	FT ²		712,628	FT ³

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	AREA	VOLUME
PLAN EL 102'-0"		
. Mechanical Room	32 x 28 896 x 62	55,552
. Mechanical Room	32 x 42 1,344 x 20	26,880
. Air Lock	24 x · 8 192 x 20	3,840
. Mechanical Room	59 x 24 1,416 x 40	56,640
. Corridor	75 x 13 975 x 19	18,525
. Exhaust HEPA Filter Room	62 x 70 4,340 x 39	169,260
. Corridor	5 x 46 230 x 19	4,370
. Maintenance	57 x 13 741 x 19	14,079
	48 x 15 720 x 19	13,680
. Manipulator Room	33 x 56 1,848 x 18	33,264
. Exit Enclosure	12 x 8 96 x 12	1,152
. Storage Room	19 x 20 380 x 19	7,220
. Steam Letdown Room	29 x 11 319 x 19	6,061
. Mechanical Room	19 x 24 456 x 20	9,120
. Transfer Dock	32 x 36 1,152 x 20	23,040
. Mechanical Room	50 x 18 900 x 21	18,900
. Emergency Generator #1	29 x 21 609 x 22	13,398
. Emergency Generator #2	28 x 21 588 x 22	12,936
. Emergency Generator #2	16 x 24 384 x 20	7,680
. Main Electrical Room	48 x 36 1,728 x 19	32,832
. Battery Room	50 x 19 950 x 10	9,500
. Cold Chemical Make-Up	34 x 38 1,292 x 21	27,132
. Mechanical Room	32 x 38 1,216 x 21	25,536
. Corridor	26 x 10 260 x 18	4,680
. SDPR Cold Chemical Make-Up Room	18 x 57 1,026 x 28	28,728
. Transformer Yard	78 x 26 2,028 x 28	56,784
. Loading Dock	14 x 22 308 x 18 57 x 35 1,995 x 18	5,544
. Loading Dock . Personnel Decon	57 x 35 1,995 x 18 18 x 16 288 x 19	35,910 5,472
. Vestibule & Staging Area	22 x 26 572 x 18	10,296
. Decon Room	13 x 7 91 x 10	910
. Access Corridor	8 x 13 104 x 18	1,872
. Office	12 x 18 216 x 18	3,888
. Instrument Repair Room	28 x 17 476 x 18	8,568
. Receiving Area Zone	36 x 23 828 x 18	14,904
. RPT Count Zone	11 x 16 176 x 9	1,584
. Communication Equipment Room	7 x 17 119 x 9	1,071
. RPT Office	14 x 18 252 x 9	2,268
. Storage Room	28 x 17 476 x 9	4,284
. 217 & 215	11 x 26 286 x 18	5,148
. Fuel Disassembly Cell	72 x 20 1,440 x 21	30,240
. Operating Gallery	281 x 18 5,058 x 20	101,160
. Fuel Transfer Canal	73 x 23 1,679 x 20	33,580
. Air Lock	32 x 60 1,920 x 28	53,760
284 & 250	64 x 7 448 x 7	3,136
. Sample Cave	50 x 6 300 x 7	2,100
. 257 & 258	40 x 11 440 x 7	3,080
. Low Level Waste Storage	18 x 71 1,278 x 62	79,236
. Exit Closure	8 x 19 152 x 12 62 x 74 4,588 x 61	1,824
. Receiving & Shipping . Mechanical Room	62 x 74 4,588 x 61 53 x 22 1,166 x 20	279,868 23,320
. Cask Washdown	53 x 76 4,028 x 32	128,896
. Cask Hashiumii	33 A 10 T, 020 A 32	140,030

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. Chemical Waste Loadout Area . Truck Air Lock . Air Lock Subtotal	18 68 11	X X X	25 21 9	AREA 450 1,428 99 56,747	x x x FT2	32 24 11	VOLUME 14,400 34,272 1,089 1,572,469	FT ³
PLAN EL 124'-0" Mechanical Room Vestibule Computer Room HVAC LPU Room Emergency Panel Room Corridor Operating Gallery Warm Maintenance Room Air Lock Corridor Exhaust HEPA Filter Mezzanine Corridor Air Lock Jet Gang Value/Instrument Room Jet Gang Valve Air Lock Mechanical Room Stairway 7 Air Lock Crane Maintenance Corridor Stairway 2 Stairway 1 Stairway 2 Stairway 4 Decon Operations Room Decon Operations Room Decon Operations Room Transfer Room Suit-Up Room Corridor Stairway 13	78 34 18 16 12 31 35 6 74 96 12 12 12 12 12 12 12 12 12 12 12 12 12	*****	424 424 421 421 421 431 431 431 431 431 431 431 431 431 43	3,276 432 304 384 434 700 72 1,184 4,608 2,550 1,568 105 120 2,210 560 2,210 2,210 4,704 192 80 84 1,224 2,178 128 144 200 176 270 480 570 300 99 126 144 31,916	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	20 99 70 14 14 12 12 12 12 13 10 10 10 10 10 10 10 10 10 10	65,520 16,320 3,888 2,736 3,456 2,688 13,020 1,000 1,000 10,976 2,100 10,976 26,520 6,720 1,440 26,520 6,720 1,480 43,560 3,328 7,480 43,560 1,000 1,0	FT ³

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(***)

Subtotals . 79'-0" . 102'-0" . 124'-0" 712,628 1,572,469 622,806 2,907,903+FT³ (2.9m FT³) 21,688 56,747 31,916 116,014 FT²

TOTALS

RWM:tst

PFM BUILDING

(CONCRETE VOLUME)

EL 79'-0" 14,922.5 YD³

EL 102'-0" 11,050.7 YD³

EL 124'-0" 7.765.0 YD³

TOTAL 33,738.2 YD³

RWM:tst